GCSE

Rewarding Learning

Chief Examiner's Report

Mathematics

Summer Series 2019

Foreword

This booklet outlines the performance of candidates in all aspects of this specification for the Summer 2019 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 section on our website at www.ccea.org.uk.

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GCSE MATHEMATICS

Chief Examiner's Report

Subject Overview

This was the first time that this new specification was examined in its entirety and therefore the first award based upon it. Although the modules M1, M2, M3 and M4 had been examined in Summer 2018 and January 2019, the completion papers for M5, M6, M7 and M8 were taken for the first time.

The performance of candidates in general suggests both that candidates had been well prepared for this specification and that the set of papers had been set at an appropriate level to allow candidates to demonstrate their knowledge, skills and understanding at the level for which they had been entered.

On the whole, familiarity with the style of the module papers for M1 to M4 meant that most candidates seemed ready to tackle questions on the full range of specification content, including topics subsumed from papers aimed at a set of lower grades. On average overall performance on these four papers showed an improvement on the previous suites of M1 to M4.

As might be expected on the first sitting of the new suite M5, M6, M7 and M8, each comprising non-calculator and calculator papers, with the influx of topics previously examined in the modular rather than the terminal papers and other topics entirely new to the specification, the papers proved slightly more challenging than the now familiar M1, M2, M3 and M4. Nonetheless it was encouraging to see candidates attempt all the questions posed and the quality of response from many was of an extremely high standard.

More detailed comment on each of the module papers is provided below.

Assessment Unit M1 Foundation Tier

Unit Overview

The paper provided opportunities for candidates to demonstrate their understanding of many key mathematical concepts and apply their knowledge in a functional capacity. There was a large variation in marks, with a small number of candidates scoring around 10% while others scored over 80%. The paper seemed accessible to candidates at this level and there were plenty of excellent responses across the range of topics and grades being assessed. There was no evidence of candidates running out of time and the majority attempted all questions. Method marks and follow through marks were awarded to credit understanding where appropriate and allow candidates to be differentiated across the ability spectrum. It was pleasing to see so many candidates attempting to set their work out methodically and although the quality of verbal reasoning at this level is poor, the majority of candidates did attempt to explain their thinking and reasons when required. There was evidence to suggest that some candidates did not have access to rulers or protractors. Others either had no calculator or chose not to use it, despite this being a calculator paper.

Comments on individual questions follow.

Q1 All parts of this line graph question were very well answered by candidates who had no problem understanding the context provided. In Part (b) several candidates gave an answer of 4, possibly due to errors in their method of counting on from 39 to 42, rather than because of any misreading of the graph. A very small minority of candidates answered Part (c) with 37/38 rather than 37.5 and lost the mark.

Q2 The first two parts of this population chart question were very well answered. In Part (a) a few candidates identified the lowest population and recorded this rather than the required year. In Part (b) most candidates were able to successfully find the fall in population though there were a number of transcription errors when recording their answer, the most common error being 76028 rather than 76082. It was evident that a number of candidates who had identified the correct values from the chart had no calculator and lost the available mark when they were unable to subtract accurately. Part (c) was much less successful with most candidates unable to state how many people the given symbol represented. Common incorrect responses included 10 000 and 1 000 000 but many other incorrect responses bore no relation to the data presented.

Q3 At this level many candidates are not confident dealing with analogue time on clocks and watches. Part (a) was surprisingly poorly answered with many incorrect answers given. Only a minority of candidates were able to read the time as 0703 and if they read the correct time they were generally able to take away 7 minutes, though correct notation was rarely seen. A common incorrect response was 0756. Part (b) was mostly correctly answered but common incorrect answers included 5.4 and 4.6, mainly seen when candidates set out 20 – 15.6 as a sum and made an arithmetical error in their computation. Candidates should be reminded to use a calculator to check their work. Part (c) was well answered by many but careless reading of the question led to rounding to 100 000 rather than 98 000. A minority of candidates expressed difficulty when rounding to the nearest thousand and answered 8 000. Part (d), estimating the capacity of a coffee cup, was well answered by many but it is clear that a significant number of candidates have little feel for the units of capacity. The most common incorrect answer seen was 40 ml.

Q4 Many candidates scored one of the two available marks, mostly for net F, with a small minority gaining both marks for identifying the two nets of a cube correctly. Net B, which only had 5 faces, was a common incorrect response.

Q5 Part (a) was very well answered with most candidates gaining both marks for finding the cost of the tickets correctly. Candidates who were unable to produce the required £16.65 gained a method mark in many cases for showing the ticket prices they were adding. A small number of candidates misread the question and found the cost of either one of each ticket or two of each. Part (b) was not so well answered with only a minority of candidates awarded both of the available marks for adding 95 minutes onto 6.40 pm. The most common incorrect response was 7.35 pm. where candidates simply added 95 onto 640, ignoring the fact that there are 60 minutes in an hour. Some candidates changed 95 minutes into 1 hour and 35 minutes and gained 1 mark if they were unable to then produce 8.15 pm. A sizable number of candidates answered 815 and lost one mark for the omission of pm.

Q6 Most candidates were successful in this question testing substitution of money in different units into a formula to calculate a delivery cost. A common incorrect response was 722.25, where candidates failed to deal with the different units. Others were unable to correctly use the formula and added the fixed charge to the rate per mile and multiplied by 12 producing an answer of 34.20

Q7 While pleasing to see many completely correct answers to Part (a) it was clear that a significant number of candidates at this level are unfamiliar with calculating gas bills from 2 meter readings. A common incorrect approach saw candidates adding the meter readings and multiplying by the unit cost. Marks were frequently lost when candidates failed to change their answer into pounds and £6800 was often given as the quarterly gas bill for Paul. Candidates should realise that this is not a sensible answer to the functional problem posed. A common incorrect method saw candidates dividing, rather than multiplying, the number of units they calculated by 16 or 0.16 In Part (b) candidates who understood how to find 10% of an amount were mostly able to gain the available marks, though some candidates proceeded to then take the 10% value they calculated away from their answer to Part (a) and lost a mark.

Q8 Better candidates were generally able to find four fifths of 2900 in Part (a). Less able candidates struggled with their method, often producing 3625 when they multiplied by 5 and divided by 4. Others correctly identified one fifth of 2900 as 580 but failed to make further progress. It is clear that at this level candidates are not being taught how to use fraction buttons on scientific calculators. In Part (b) the majority of candidates recognised that $\frac{3}{4}$ is larger than $\frac{2}{3}$ but a significant number were unable to explain why, even with the inclusion of a pair of 4 by 3 grids. Common incorrect reasons provided included conversion of the given fractions to decimals or percentages that were wrong, for example, $\frac{2}{3}$ was often recorded as 0.6 or 60%. Other candidates simply stated that 3 and 4 are bigger numbers than 2 and 3. Part (c) was poorly answered with Sara the most common incorrect choice, where candidates added the numerators and denominators. Again it was apparent that candidates were not using their calculator to help with this part of the question. At this level it is expected that candidates should recognise that the sum of $\frac{3}{4}$ and $\frac{2}{3}$ is greater than 1.

Q9 This was answered very well by the majority of candidates, with full marks awarded frequently. Candidates who were less successful often failed to subtract the cost of the Child ticket from the £57 total and tried various combinations of Adult and Senior Citizen tickets to build an answer up to £57 which was not feasible. They then gave answers for the number of tickets that summed to a value as close to £57 as they could find. A few candidates transposed their answers but were awarded 2 of the 3 available marks if their working supported the correct ticket numbers.

Q10 Only a minority of candidates answered this question on inequalities correctly. It was not clear whether candidates have little understanding of inequalities or if they were unable to convert between fractions, decimals and percentages accurately in order to make the appropriate comparisons.

Q11 The majority of candidates were successful in Part (a) and were able to extract the required information from the back-to-back bar chart in order to answer the question. Part (b), however, was poorly answered by most candidates. Common incorrect responses saw candidates attempting to justify their answer by comparing gender by week rather than totalling by gender over the 4 week period. Some candidates who were careless in their addition gained one of the two available marks for correct method.

Q12 Part (a) was disappointing as most candidates were unable to calculate the volume of a cuboid. A common incorrect approach saw candidates adding, rather than multiplying, the given dimensions and recording 41.5 as their answer. Candidates who correctly found the volume as 2100 frequently lost the available units mark for either not providing a unit or writing cm or cm^2. Part (b) was only answered correctly by a small minority of candidates with most responses either blank or showing an incorrect method. The most common wrong approach was to divide the answer to Part (a) by 15 and 2100 ÷ 15 = 140 was seen frequently. Few candidates considered

converting 15 litres into millilitres and dividing this by their answer to Part (a). Better candidates who did apply the correct method sometimes lost the final accuracy mark when they failed to round their answer down to 7.

Q13 Candidates sitting this paper often struggle with the abstract nature of the algebra questions set. On this question, however, there was quite a pleasing response by candidates with the majority gaining at least some of the six available marks. Part (a) was correctly answered by a significant proportion of the cohort and where full marks were not awarded often one mark was allowed for a partially correct solution. The most common incorrect response resulted from a failure to deal with the subtraction of 2e from 5e appropriately with many candidates clearly not understanding that 5e added to –2e is 3e and not 7e. Few candidates had difficulty in Part (b) and the correct answer of 14 was the norm. Part (c) proved challenging for many and although the correct answer of 45 was seen frequently 5 was a more common response which was seen when candidates divided 15 by 3 instead of cross-multiplying 15 and 3. In Part (d) it was good to see so many candidates awarded both of the available marks. Incorrect responses generally stemmed from errors in method. A frequently given wrong answer was 27 which came from 54 – 27 and showed a lack of understanding of basic algebraic conventions. Another common incorrect approach saw candidates providing answers such as 20t – 14r. When candidates added their correctly substituted values and produced an answer of 34 they were awarded 1 of the available marks.

Q14 What seemed initially to be a straightforward functional problem on the cost of cutting a lawn by finding the area of a rectangle and charging £2 per square metre proved to be much less successful than anticipated. Better candidates correctly found the area as $32m^2$ and doubled it leading to the correct answer of £64. This was far from the norm however with many candidates dividing, rather than multiplying, their area by 2 and others working with a perimeter rather than an area.

Q15 This pie chart question was unusual in that the table contained two entries that were equivalent to zero which caused some confusion when drawing the chart in Part (b). Part (a), totalling the number of people column from the table, was correct on most scripts and any incorrect responses were usually due to careless addition and lack of checking. Many candidates at this level are proficient in calculating the angles of sectors and accurately drawing and labelling pie charts and it was pleasing to see many correct responses. It was evident, however, that some candidates did not have access to protractors or rulers as sectors were often drawn freehand and angles 'estimated' despite having recorded the correct angles in the workspace. Other candidates who were not proficient in their use of protractors lost marks when their angles were outside of tolerance. Less able candidates often failed to produce the required angles and gained no marks. Some candidates, confused by the zero entries, added a couple of extremely narrow additional sectors and were penalised for their incorrect method. Candidates often labelled their sectors inappropriately and it was not uncommon to have sectors labelled with a mixture of 'number of times' and 'number of people'. Part (c) was understood by a minority of candidates who were able to correctly find the modal time. A common incorrect response was 11 where candidates identified the greatest frequency but failed to understand that this referenced '4 times'. Another answer which frequently occurred was 6, presumably since it appeared twice in the table. Part (d) was poorly answered by the majority of candidates who were clearly unprepared to find the total from a frequency table. Candidates who understood what was expected generally produced the required answer of 135. More common were answers of 30 and 18 where columns in the given table were simply totalled. Several candidates misinterpreted what was being asked and followed on from their answer to the previous part and gave an answer of 44 times which came from the modal time of 4 for 11 people.

Q16 Many candidates scored full marks for calculating 35 members of the running club by subtracting 25 from the total bill and dividing by 1.2 Again it was evident that some candidates either did not have a calculator or chose not to use it and struggled to divide 42 by 1.2 Some candidates resolved the issue of dividing by 1.2 by repeated addition of 1.2 up to 42 though errors often led to incorrect answers. It was clear that a minority of candidates failed to understand what the question was asking with some adding the set up fee to the total bill and then either dividing or multiplying by 1.2

Q17 A large number of candidates were awarded at least one of the three available marks, often for correctly finding the £30 annual interest amount. Careless reading of the question led to some of the better candidates working with compound rather than simple interest. Common mistakes included using 0.2 as the decimal equivalent of 2%, adding the total interest on to the principal amount and calculating 2% of 1500 by multiplying by 100 and dividing by 2.

Q18 Better candidates had no problem with either part of this question on angle theory. Others, however, showed little understanding although in many cases were awarded partial marks in Part (a). Common incorrect responses to the first part of the question included 292 for adding the given angles in the quadrilaterals and doing nothing else, 128 for subtracting 52 from 180 and 68 for taking 292 away from 360 and failing to apply the fact that angles on a straight line sum to 180° to find x. A significant number of candidates could not subtract 292 from 360 or 68 from 180 accurately despite this being a calculator paper. In Part (b) candidates who knew that the angle sum of a triangle is 180° were often let down by not knowing which angles were equal in the given isosceles triangle. This frequently led to answers of 32. Candidates who applied the correct method struggled in some cases to find half of 148 correctly and lost the final accuracy mark.

Q19 This unstructured question on finding the cost of 1 kg of potatoes was challenging for all but the best candidates. While completely correct answers were seldom seen the award of two of the four available marks was common when candidates were able to produce £1.26 for the cost of 1.8 kg of potatoes. A major stumbling block to progressing through the question was the inability of a large number of candidates to correctly multiply 3.2 by 6 to find the amount of money spent on mince. Use of calculators should be encouraged by centres when solving problems such as this. A small number of candidates lost the final mark when they failed to convert their 0.7 into 70p on the answer line.

Q20 Better candidates gained all three marks for changing subject marks into percentages and showing that the Geography mark was higher than the English mark. Some minor arithmetical errors were penalised and work followed for part marks where candidates followed a correct method. Candidates who decided to change the given marks into decimals and compare were mostly successful though 28 out of 40 converted to a decimal as 0.7 caused confusion for some when they did not realise that 0.7 is greater than 0.64 and 0.68 Candidates who converted the marks to fractions were mostly unsuccessful as they were unable to produce a correct common denominator. A common incorrect approach was to check how many questions were wrong in each subject and base answers on this.

Q21 Full marks for this question on percentage reduction were infrequently awarded though part marks were awarded to a significant number of candidates for successfully calculating 35% of £880 as £308. It was evident that careless reading of the question cost many candidates marks when they gave £308 as the reduced price of the sofa and compared this to £570. There were a number of blank responses and again a minority of candidates were not using a calculator as method shown included finding 10% of 880 as 88, multiplying by 3 and adding half of 88 to find 35%.

Q22 Candidates at this level struggle to produce linear graphs from an equation and most were awarded none of the three available marks. Only a very small minority of responses were completely correct although some candidates were awarded 2 marks if they identified at least 2 correct points but failed to join them with a line. A consistent incorrect plot at (2, –4) was seen often, as were lines drawn at $x = 2$ and $y = -4$ to intersect at (2, –4).

Q23 It was pleasing to see that the majority of candidates were still attempting questions towards the end of the paper and this scatter graph question was accessible to most. The majority of responses to Part (a) gained at least 1 of the 2 marks for plotting the remaining points. It was common to see candidates labelling their plotted points with the letter referring to the individual referees. Others drew lines of best fit although this was not required and a minority of candidates joined the points as if they were drawing a line graph. Part (b) was very well answered in general although some candidates did misunderstand what was required and inserted numbers instead of a word such as 'fewer' or 'less'.

Q24 Better candidates scored well on this question on the mean, mode and range of five cards. Less capable candidates were mostly awarded one mark for identifying 5 as a missing card and satisfying the statement relating to the mode. Often no further progress was made as candidates failed to recognise that if the mean of the cards was 6 then their total had to be 30. Candidates who worked with a total of 30 had no problem identifying the final card as 9 and producing the correct range of 6. A small number of candidates did however lose the last mark if they gave the range as '9-3'.

Q25 Calculating the mean from a frequency table proved beyond what most candidates at this level were capable of. Many candidates simply divided the total frequency of 30 by 5, the number of different absences recorded, to produce a mean of 6 days absence, this despite the highest number of absences being 4. Those who used the correct method to find the total of 39 often didn't know what to divide by and answers were again given which made no sense in the context of the problem. A minority of candidates who attempted to find the total by multiplying the number of absences by their frequencies multiplied 0 by 10 and recorded this as 10. A few candidates did, however, provide the correct answer of 1.3

Q26 The majority of candidates struggled to complete the Venn diagram accurately. Although the overlap 35 was mostly correctly placed for 1 mark most of the cohort placed 95 and 75 rather than 60 and 40 in the other areas of the diagram. This then led to the most common incorrect response seen of 5 where candidates added the given numbers to 205 and assumed the excess of 5 was the number of candidates studying no languages. Rereading the information given would alert candidates to the fact that a total of 205 was not sensible. Consequently it's clear that most candidates do not check their work or reread questions before moving on. Candidates who managed to complete the Venn diagram accurately generally produced the correct answer of 65.

Q27 Better candidates were awarded full marks for finding the correct angle as 160° and many others gained at least one mark for identifying angle PSQ as 110° from their knowledge of straight-line angles. The use of the 50° alternate angle was seen much less often but where it was shown candidates generally found the missing angle of triangle PQS as 20° which they then took away from 180° to gain the marks available.

Assessment Unit M2 Foundation Tier

Unit Overview

This paper proved to be widely accessible to candidates across the ability range. Most were able to attempt the majority of the questions, with little evidence of them 'giving up' before the end. There was no evidence of misinterpretation of questions, or of candidates not having sufficient time to complete the paper.

A range of functional questions allowed candidates to demonstrate their ability to select the correct mathematics to use in real life contexts, with many demonstrating sound knowledge of working with percentage change.

It was, once again, pleasing to note that the vast majority of candidates show clear working in almost all questions, allowing them to secure many method marks, even in questions where they fail to obtain the correct final answer.

Once again there were some very weak candidates who experienced little success and probably should have been entered for M1, while the significant number of candidates scoring very high marks may have been better to have attempted M3 in order to access Grade B.

Some issues remain around the use of mathematical equipment. Many candidates appear not to have access to basics such as a ruler, protractor or calculator. A significant number also seem to think that when a question says 'calculate' or 'work out' they need to show a pencil and paper calculation, rather than use their calculator. This results in an unnecessary loss of marks when numerical errors are made.

Q1 Part (a) was generally well done, with candidates using either the 'divide by 5, multiply by 4' method, or finding 80%. In some cases candidates went on to subtract the 2320 from 2900, presumably thinking they needed to find how many journeys left late, rather than how many left on time.

It was disappointing in Part (b) that so many candidates were unable to correctly shade the grids. A common approach was to convert the fractions to percentages, but some incorrectly used 60% or 0.6, rather than 66/67% or 0.66/0.67

The most common wrong answer for Part (c) was Sara, with very few opting for Tanya.

Q2 The important first step in this question was to subtract £5 from £57 to leave £52, which not only gained the first mark, but also allowed candidates to easily work out the number of adult and senior citizen tickets. Only a small number got the two types of ticket mixed up and wrote the 2 and 3 the wrong way round.

Q3 It is concerning that a number of candidates seemed to have no idea what to do in this question, with a small, but significant, number writing the word 'or' into one or more of the answer boxes. A common error was to assert that 0.3 was equal to 3%.

Q4 Part (a) was straightforward and generally correct.

Many candidates struggled to give a valid reason in Part (b). A significant number opted to disagree with the statement for reasons such as 'males were higher in 2 weeks, females were higher in 1 week and they were equal in the other'.

This, of course, takes no account of the scale of the differences and is not a valid reason. Of those who attempted to find the totals for male and female, some made simple errors in the addition, but still gained the mark for giving a valid reason based on their values.

Q5 In Part (a) the volume was generally correct, but units were missing or incorrect. Some candidates used millilitres and even litres as units, which was acceptable, although a number opted for cm^2.

Part (b) was not well done at all. Many divided the wrong way round and did 2100 ÷ 15 giving 140. Of those who correctly converted the 15 litres to 15000 ml and then divided by 2100, the vast majority correctly chose 7 as the correct answer, although this may have been helped by the fact that rounding it to the nearest whole number would still have produced 7 rather than 8.

Q6 Part (a) was generally correct, although some candidates, having got the 10c + 3e, tried to simplify it further, coming up with answers such as 13ce.

Parts (b) and (c) were straightforward, with some candidates making the expected error in Part (c) and getting 5 rather than 45.

Part (d) caused some problems, with a number of candidates still leaving letters in their final answer. A common wrong answer was 34, with the numbers being added rather than subtracted. It is concerning that a small, but significant, number of candidates simply 'replaced' the letters with numbers, writing 54 – 27 = 27

Q7 The distinction between area and perimeter seems to remain as unclear as ever, with many candidates finding the perimeter of the lawn. The vast majority realised that they needed to multiply their answer by 2, although some chose to divide instead.

Q8 Part (a) was mostly correct and served to point candidates in the right direction, given that the table did not have a blank column.

Most were able to work out the correct angles in Part (b), but there still seems to be a significant number of candidates who do not have a protractor, or don't know how to use it. Those that were properly drawn were generally correct. Labelling caused some issues, probably because the 'categories' were numbers rather than descriptive names. Some candidates included the 'zero' categories in the pie chart.

In Part (c) the terminology 'modal number' seemed to cause some confusion, with less than half of candidates securing this straightforward mark.

The number of correct responses to Part (d) was pleasing, given that no extra column was given in the table and that the question was not directly below it.

Q9 While some candidates attempted to use a 'counting on' method, starting from £25, most adopted the correct approach of subtracting the £25 and then dividing by £1.20 Few numerical errors were seen from candidates who used the better method.

Q10 This question served to highlight that candidates are so well prepared for compound interest questions that they didn't seem to understand what simple interest was. It is important that both are taught. The vast majority of candidates were awarded the first mark for evidence of the fact that 2% of £1500 is £30. A small number slightly misinterpreted the question, giving £1590 as the answer, rather than the £90 interest.

The terminology 'per annum' did not appear to be well understood. It would be beneficial for candidates to have a more realistic idea of how much interest is earned in today's financial climate, as some came up with very unrealistic answers.

Q11 While the majority of candidates correctly added the 3 given angles to get 292°, the most common incorrect answer in Part (a) was, as expected, 68. A small number were confused by 'angles on a straight line' and performed the calculation '180 – 52 = 128'.

In Part (b) those who chose the correct method generally went on to get the right answer, so the mark for this question tended to be either 0 or 2.

Q12 This question was much better answered than in previous years, perhaps due to the fact that there was no need for a change in the unit of mass (everything was in kg) and that the number of kilograms of potatoes was greater than 1. A majority of candidates got at least 2 marks for working out that the potatoes cost £1.26 in total. A small number failed to interpret their calculator answer correctly as 70p, but in general those who realised they needed to divide by 1.8 went on to get full marks.

It was disappointing to note the number of candidates who were unable to correctly calculate 6 × 3.2, with many doing 6 × 3 and then using a variety of incorrect ways to try and add the extra 0.2

Q13 It was pleasing to see that the vast majority of candidates realised they needed to convert to either a common denominator, percentages or decimals, with a significant number opting for the latter. Most gave a correct statement based on their calculations, even when they had made an error.

A significant number thought that performance depended on the number of marks lost, regardless of how many marks were available in total.

Q14 Many candidates demonstrated their ability to work with percentages in this question, either by subtracting their 35% or by using the multiplier 0.65 Some correctly found the £572 and then used a rounding argument to claim that the statement was valid. Some adopted a completely different approach and calculated the reduction of £310 as a percentage of £880, giving 35.2%, and stating that this was not 35%.

Q15 Another very functional question which required candidates to use their financial capability to solve a real life problem.

In Part (a) some candidates chose to divide by 12 first, then add the 8%, but the majority got the £907.20 first and then divided. There were some issues with reading their calculator answer as £75.60, with some leaving £75.6 on the answer line.

In both parts, some candidates got the percentage increase and decrease the wrong way round, but clear working allowed many to access at least 1 mark in Part (b) even if their answer to Part (a) was incorrect.

Q16 A much more straightforward set of axes allowed most candidates to plot the points correctly in Part (a).

In Part (b) lines of best fit still have a tendency to be drawn 'corner to corner' or with almost all points lying on one side.

For Part (c) some candidates gave a decimal answer. The mark was still awarded, but they should be taught that a decimal answer was not appropriate in this context.

Q17 It was pleasing that most candidates realised that at least one of the cards had to have the number 5. The success of the rest of the question hinged on whether or not they realised the cards needed to add to 30. In general those who did went on to get the correct answer.

Q18 This is one of the 'new' topics on M2, but this question was much more straightforward than the last time the topic was tested. While many correctly inserted 35 in the overlap, a disappointing number went on to insert 95 and 75 in the circles. Some even wrote a comment that the question was impossible as the total was greater than 200!

Those who correctly completed the Venn diagram usually went on to get the answer of 65. It should be noted that some only wrote down 65 on the answer line and lost the 3 marks for completing the diagram, which the question clearly instructed them to do.

Q19 While many candidates were able to correctly identify the 110° and the 50° at angle TUS, a much smaller number went on to spot the corresponding angle SPQ. Those who did generally went on to get the correct answer.

Q20 This was one of the most poorly answered questions on the paper, with many candidates failing to recognise that they needed to find the midpoint of each group before proceeding. It may be that the lack of additional blank columns meant they weren't 'prompted' to do so. It was frustrating that a number of candidates were able to correctly find the total of 345, but then failed to use it to find the answer. Candidates should be taught not to round their final answer to the nearest whole number.

Q21 While many candidates were able to correctly multiply out the first bracket, they went on to get '-10' rather than '10' as the final term of the overall expansion. The use of negative numbers and negative number rules caused great difficulty. A small number of candidates also combined all the terms together and gave their answer as a single term.

Q22 The most successful candidates in this question used the 'prime factor tree' method rather than the 'division box' method. The latter often results in them 'missing' the last prime factor. While many had the decomposition all correct, common errors included a failure to convert to index notation, a missing 'x' sign, addition rather than multiplication or the prime factors given in a list.

Q23 Candidates should be taught that when the question asks them to 'form and solve an equation' then they must do so, otherwise no marks will be awarded. The inclusion of the additional answer line starting with the word 'equation' seemed to help a little, but some still simply worked out the final answer with no equation and gained no credit.

Of those who formed and solved the equation correctly, some left their final answer as the value for x, rather than the size of the smallest angle.

Q24 It was pleasing to see that a significant number of candidates at least realised this was a Pythagoras' Theorem question, with many accessing the first mark for simply drawing a correct diagram.

The most common error, of course, was to fail to recognise 12cm as the hypotenuse, and instead try to calculate it. Those who knew what they were doing generally went on to get the 11.3cm correct, although a significant number failed to answer the question, which asked for the perimeter of the triangle.

Q25 In Part (a) the most obvious price to start with was £100, although a vast array of different prices were chosen, some which made calculations very difficult! Many simply added £20 and then took it away again, failing to show that the final price was lower.

Some candidates were able to find the percentage decrease in Part (b), with those who started with £100 having the most success.

Candidates who got Part (a) correct also tended to get Part (c) correct. Most gave a correct conclusion, even if they had made numerical errors which meant their outcome was not the same.

Assessment Unit M3 Higher Tier

Unit Overview

The performance by candidates on this paper was generally very good and perhaps overall performance was better than previous candidates at this level, with many very high scoring scripts. There was still some evidence that topics not previously assessed on M3 showed gaps in knowledge, in particular pie charts and Venn diagrams. There was also clear evidence that some candidates did not come equipped with a protractor.

There were plenty of straightforward questions to enable weaker candidates to experience success across a range of topics, balanced with more challenging questions to stretch and distinguish the better candidates. The responses to the more open-ended questions in Questions 7, 9, 11 and 19 was most encouraging with Question 20 proving the most challenging, albeit the vast majority of candidates would not have realised the higher order thinking needed here and perhaps thought they had answered the question successfully, by using half the surface area of a sphere and concluding that Mary was correct. For questions which carried a significant number of marks, it was rare to see them not attempted. In most cases, candidates were able to offer some attempt and so many part marks were accessed even if a fully correct solution was not reached. This meant that candidates were accumulating marks right throughout the paper, which no doubt contributed to more than usual high totals on the overall paper.

There continues to be improvement in the methodology and presentation of pupil work, allowing many partial marks to be awarded. This was very much evident in multistep questions such as Question 5 – angles, Question 9 – statistical measures, Question 18 – Pythagoras' Theorem and Question 23 – fractional equation. There was a positive response to most Number questions, in particular those assessing financial aspects. Some areas of Algebra displayed weakness as seen in Question 15 expanding and simplifying two sets of brackets, Question 17 forming and solving a linear equation, Question 22 solution of a quadratic equation by factors and Question 24 writing the equation of a parallel line. Questions which were challenging and were answered with varying levels of success included Question 6 – bill, Question 19 – percentage increase/decrease and Question 26 – reverse percentage. Questions 20 and 21 differentiated well between the very best who understood all requirements of these multistep questions.

Numeracy skills were tested directly and indirectly (through data, geometry or algebra) in Questions 1, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 18, 19 and 23. For the most part, questions with a purely numerical aspect are usually well answered but it is apparent that calculators are not being used to best effect when answering such questions. This was very apparent in this paper in Question 5 and Question 13 where angle calculations were done by hand and in Question 6 where candidates tried to evaluate 3.2 x 6 by manual calculation (with many going wrong). Questions with a functional element were generally well answered including Questions 1, 3, 4, 7, 8, 11, with perhaps Questions 6, 19, 21 and 26 proving more challenging with more varied outcomes. Literacy and communication were a feature of Questions 7, 9, 11, 19, and 20. There has been an improvement in the ability of most candidates to present their reasoning clearly but some still find it difficult to articulate their thinking in clear mathematical language. This was evident in Questions 7, 11 and 19 where some candidates with correct mathematical evidence still found it difficult to communicate their conclusions and in some cases actually contradicted what their calculations had just shown.

Q1 This question on ticket prices proved a great opening question with success for nearly all candidates.

Q2 There was a very varied response to the pie chart question. Many had difficulty in part (a) with reaching the correct total for the number of times people attended the cinema. Drawing the pie chart in Part (b) also gave a mixed response. Unfortunately, many who had correctly answered Part (a) then inadvertently used the 135 total rather than the total number of people when trying to convert to angles. There was also evidence that a significant number of candidates seemed to not be equipped with a protractor to complete the question accurately.

Q3 The finance question, manipulating the total bill to find the number of people in the running club was very well answered. Occasionally candidates recorded an extra person in their answer, by misinterpreting the setup fee as another T-shirt cost.

Q4 Too many candidates lost easy marks in what should have been a straightforward money question. A large proportion answered this via a compound interest approach rather than reading the information as written, which was to calculate the simple interest. Even for those who did apply simple interest, a mark was often lost for recording the final investment rather than the interest itself.

Q5 Calculation of the angles was well approached. In Part (a) there were many completely correct solutions but also many who just fell short of the final solution by finding the fourth interior angle of the quadrilateral and failing to subtract it from 180° to find the exterior angle. In Part (b) nearly all candidates were able to find the base angle of the isosceles triangle.

Q6 This was the first question on the paper that proved challenging for many. Despite having a calculator, candidates struggled to find the cost of the 3.2kg of mince at £6 per kg with many trying to split the 3.2kg into two separate masses. For those who were successful to that point, many then struggled to decipher the next stage after subtracting from the total. Division by 1.8kg to find the cost for 1kg of potatoes was only completed by the best. It seems that candidates understanding of how to calculate with non-integer masses proved problematic even though identical operations would have been necessary with whole numbers. Hence this question was good at differentiating between candidates of varying ability.

Q7 The question comparing exam results was very well responded to with the vast majority understanding the need to convert the three test results to comparable fractions, decimals or percentages. Occasionally, weaker candidates simply calculated the number of wrong answers for each subject with no consideration given to the varying totals.

Q8 The financial question relating to car insurance was a good discriminator question between candidates of varying ability. Very many secured all available marks. On occasion a mark was lost due to incorrect money notation where candidates did not record a zero in the second decimal place since it did not appear on their calculator. This needs to be highlighted to candidates. Many others achieved part marks for some correct work in this question. It was the reading and interpreting of the given information that distinguished the success or otherwise in this question. A significant number applied calculations that did not match the questions specifically posed in Parts (a) and (b) and with a little more care, better marks could have been attained by candidates.

Q9 The novel approach to assessing statistical values was well responded to, where many clearly distinguished the averages and were able to bring all the information to a successful conclusion. Where this did not happen, it was interpreting the mean of the five numbers to be 6 which posed the difficulty in progressing if they didn't recognize the total to be 30. For some who managed this part the information regarding the mode being 5 was overlooked and they recorded the last two cards both as 7, subtracting the total of the three given cards from the 30. The key to success in this question was reading and interpreting all the available information.

Q10 There was generally a good response to the factorisation questions with the usual pitfalls of not removing the largest factor in Part (a) or not knowing how to deal with the 1 required as the second term in the bracket in Part (b).

Q11 The question on filling the barrels resulted in a multitude of interesting and unpredicted but correct approaches, which was a delight to see. Some solutions included forming equivalents and deciding what was needed to fill A and B from C, halving the contents of C and adding to A and B or adding the three contents and proving there was sufficient to fill at least two barrels. There were very other varied approaches. On the whole, the question was well attempted and even for those who could not reach a valid conclusion many secured part marks by correctly converting to values in some equivalent format – decimal, fractional or percentage. Occasionally candidates converted ⅔ to 60% rather than 66/67%

Q12 The Venn diagram was a very good discriminator question. Nearly all were able to present the 35 in the overlap for the first mark. Just over half the candidates then knew to subtract the overlap from the given totals for French and German but the remainder of the candidates did not and simply presented 95 and 75 in the Venn diagram. Whilst some forgot to include the remaining 65 candidates within the rectangle, many did realise this was what was required on the answer line. There was some indication that candidates were not at all familiar with this form of statistical presentation.

Q13 Calculation of the angles was generally good, if assumptions were not made. Most were able to calculate the angle adjacent to the 70°. However, some simply inserted an incorrect right angle on the diagram at S. Whilst SUT was often identified as 50° some struggled to relate it to the alternate angle at SPQ. There was often another incorrect assumption that PSQ was isosceles with many placing 35° at both P and Q. Hence there were many varied responses to this question but also very many completely correct responses.

Q14 Locating the modal class in Part (a) was generally well known but it appeared several simply recorded a group width of 5. Calculation of the mean in Part (b) had a promising response with the usual pitfalls of using incorrect midpoints, upper/lower bounds, dividing by 6 rather than the total number of patients or by unnecessarily rounding the final correct value of 11.5

Q15 The algebraic expansion and simplifying of the two brackets yielded a mixed response for such a standard topic. Many recorded the final term of the second bracket as –10 rather than +10 and even those who had the +10 only the best gathered the terms correctly to arrive at the correct answer of $6x - 2$. Frequently $6x - 22$ was recorded as the simplified answer. For a standard algebraic type question, there was a disappointing response to this question.

Q16 Recording 200 as a product of primes in index notation was very well answered. The fact that many simply recorded the answer would indicate that candidates are now familiar with the related calculator function.

Q17 Forming and solving the equation to solve the angles in a triangle proved problematic for very many. As is always stated in the Examiners Report, failure to record an equation followed by a simple numerical approach accrues no marks as the assessment objective here is Algebra. In this series the layout of the question with the Equation line presented separately was to encourage candidates to approach in this manner, but this was often overlooked. The vast majority did not link the sum of the angles to 180°. For those who did, the solution of $x = 30$ was often easily found but the requirement to then work the smallest angle was not completed. Some who did try to find this last part assumed it was the angle $2x$ and not the angle $2x + 10$ which was correct thinking but gave no consideration to the $x + 20$ angle which in fact led to the correct solution. Hence, full marks in this question was only secured by the very best candidates.

Q18 Calculation of the perimeter of the right-angled triangle yielded many good responses. Where the sides of the triangle were appropriately labelled, the execution of Pythagoras' Theorem was often good with some just falling short of then finding the total perimeter or forgetting to record the perimeter correct to 1 decimal place. Too often those who did not sketch a diagram simply approached Pythagoras' Theorem by squaring and adding the two given sides with no understanding that 12cm was the hypotenuse.

Q19 There was a mixed response to the percentage increase/decrease question. In Part (a) very many were able to manipulate the first percentage increase correctly but some then proceeded to decrease their original value again rather than the increased value. Selection of a good original price such as £100 often helped candidates progress easily with the question. There were very few correct responses to the overall percentage decrease with too may simply recording 20% or 40% without any due consideration to their values calculated in Part (a). Many who were successful in Part (a) were also successful in Part (c) although some lacked sufficient detail to justify their answer, simply lifting values already calculated in Part (a). Even with correct calculations only a minority actually worded their solution correctly that the outcome would in fact be the same.

Q20 The novel approach to the question set on the surface area of the solid hemisphere led to many making the incorrect conclusion. Too many calculated the surface area of a sphere, proceeded to halve it and because it led to the area suggested by Mary, they gave no further consideration to the problem set. Only the very best included the base of the hemisphere leading to the correct solution offered by Martha.

Q21 The question on the submarine required candidates to combine their knowledge on two subject areas. Unfortunately, despite the mark allocation of 4 marks very many simply applied the compound measure formula for speed and concluded that in one minute the submarine travelled 720m, without any recognition of the requirement to find the vertical depth. There were also those who applied the trigonometry using 20m/s with no consideration given to the speed. Only the very best candidates collated all the information to reach the correct conclusion.

Q22 There was a very limited response to the solution of the quadratic equation. Few completely correct solutions were seen; in fact few valid approaches were presented. Where factorization was recognized the question was straightforward. More often candidates used a trial and error approach with some reaching the positive solution of $x = 4$. Many others simply tried a linear approach of rearranging the algebraic and numerical terms.

Q23 Approaches to solving a fractional equation have definitely been improving over the last few exam series. Unfortunately, the request to record the answer as a mixed number in this question was overlooked by many and so the last mark was lost.

Q24 Very few candidates were able to record a correct equation for a parallel line. The knowledge and understanding just wasn't apparent. Too many simply changed the sign of terms or multiplied the given equation through by some scalar value.

Q25 In Part (a) plotting the values given in the cumulative frequency table was accessible to most. There were some who didn't interpret the table correctly, assuming the given values were simply the frequencies and proceeded to add the cumulative frequencies again. In plotting there were some issues with the horizontal scale and where to plot. Too many candidates are still losing a mark by being extremely careless when joining their points by a curve and are clearly missing points. Where a good curve was drawn many were successful in answering Part (b) but some fell short of the final answer by only recording their reading at 55 and not subtracting it from 160.

Q26 The last question on reverse percentages probably had the most disappointing outcome of all. In the last few years candidates have become very adept at answering this style of question but for some reason this wasn't apparent here. The vast majority used the common incorrect approach of finding 7.5% and subtracting it from £29455. Hence only a small proportion of candidates reached the correct conclusion here.

Assessment Unit M4 Higher Tier

Unit Overview

The performance of candidates in this paper was generally very good. In the papers I marked, the marks ranged from 13 to 98, with many candidates achieving 50 and above.

The general feeling from all examiners is that the paper was successful in allowing candidates of differing abilities to respond positively and most questions were attempted – it was unusual to see blank answer spaces. Similar to the January 2019 sitting, there are still a number of candidates who lost marks in the more straightforward, C grade questions, but then proceeded to pick up marks for the harder, A/A* questions towards the end of the paper. The last few questions did stretch the more able candidates, with only the very best scoring highly in questions 21 and 22 (b).

Presentation of work was generally good; however, candidates are still not taking enough care in drawing cumulative frequency graphs and they are losing marks for multiple lines/ curves or for not drawing their line/curve through their plotted points.

Candidates' mathematical language and notation when it comes to algebra in particular are in need of improvement. It is becoming more common to see candidates attempting to subtract multiple terms without writing brackets, but then proceeding to work as if they are there, i.e. $180 - 2x + 10 - x + 20 = 2x$ becoming $150 - 3x = 2x$. Also, when candidates are forming common denominators and relevant numerators in algebraic fractional equations, there is a tendency to omit the first brackets yet proceed to multiply out correctly, i.e. $x+1(x - 4)$ appearing in the work, then leading to $x^2 - 3x - 4$. Candidates need to be advised that correct use of brackets is essential.

For basic questions on solving a quadratic equation too many candidates are reliant on trying to use the quadratic formula rather than factorising. These candidates usually make mistakes in using the formula and it might be better for them to learn how to use basic factorisation.

Questions/topics which seemed to cause most problems in general were Question 6 (choosing a starting value and dealing with percentage increase followed by decrease), Questions 16(a) and (b)(i) (writing an expression in terms of x for the length of the side of a square and in particular setting up a quadratic equation), Question 17 (finding the equation of a perpendicular line), Question 18 (finding the area of a shaded section of a sector),

Question 20 (b) (finding the median from a histogram), Question 21 (explaining reasons for finding angles using circle theorems), Question 22 (a) (factorising a quadratic with 2 variables), Question 21 (simplifying algebraic fractions with addition and multiplication).

There were a few very good candidates who were getting almost full marks up to Question 19 but did not attempt any other questions and I assume they saw the blank page and stopped (even though it says clearly 'questions continue overleaf'). This is worth pointing out to all future candidates to ensure this mistake is not made again.

Q1 This grouped frequency question on finding the mean was answered very well in general. The majority of solutions were well set out, with candidates using the available space to add columns for mid-points and fx. A small number of candidates attempted to add the 'number of patients' column then divide by six. Others attempted to multiply the frequency by either the class width or the mid-points with some not even using consistent mid-point values, or using 3, 8, 13, 18, etc. Some who arrived at the correct answer of 11.5 proceeded to record the group in which it appeared as their answer. Candidates were penalised if they rounded their answer to 12.

Q2 In this algebra question on expanding brackets and simplifying, the majority of candidates attained at least one mark with a lot of fully correct answers. A common error was multiplying –2 by –5 and getting –10 in which case a follow through mark was awarded for obtaining $6x - 22$. Some correctly expanded and simplified but then continued and divided by 2 to get $3x - 1$.

Q3 This prime factorisation question was answered very well with most candidates gaining full marks. Despite the prime factorisation function available on many calculators, most candidates still showed their working out. Only a few lost a mark for: failing to record their answers using index notation; separating prime factors with commas or plus signs; including 1 as a prime factor; simple arithmetical errors in the working.

Q4 In this question on forming an equation using algebraic angles in triangles nearly half the candidates gained full marks as they were able to form the correct equation, work through and solve it correctly and continue to find the smallest angle. However, many of the candidates who tried to start with "180 – ...." made mistakes as they did not include brackets around the angles they were subtracting,
e.g. $180 - 2x + 10 - x + 20 = 2x$. A few candidates forgot to work out the smallest angle (i.e., giving x as their answer) or found the $2x$ angle by mistake. A small number of candidates wrongly assumed it was an isosceles triangle and set the bottom angles equal to each other.

Q5 This Pythagoras' Theorem question was answered very well by most candidates with either 4 or 5 marks gained in most cases. Of those who lost a mark, some neglected to calculate the perimeter once they had calculated the missing side of 11.3cm. Others recorded their answers to 2 decimal places, as opposed to 1 decimal place as stated in the question. A minority of candidates applied Pythagoras incorrectly and therefore could only gain one mark if they sketched the diagram correctly.

Q6 This increase/decrease percentage question (a) was answered well by most candidates. Most candidates chose £100/£1000/£200 as their starting price. The main mistake was that candidates treated this question as a reverse percentage question. Some misinterpreted the question and worked out 120% then 80% of the original both times.

For this overall percentage change question (b) those who got Part (a) correct generally got full marks in Part (b). If candidates got Part (a) wrong, then only a few got follow through marks for a correct answer for their values. Many candidates used

wrong formula to work out the overall percentage decrease or mixed up the original values. A common wrong answer was 20%.

The majority who got Part (a) correct got full marks for Parts (b) and (c). Those who got Question 6 (a) incorrect could not justify Part (c) correctly and therefore lost either one or both marks.

Q7 This question on the surface area of a hemisphere was answered quite well with the more able candidates obtaining full marks. The ability to calculate the curved surface area of the hemisphere was quite clear from the majority of candidates, however, a large number of candidates only found the curved surface area, forgetting about the circular base and hence chose 'Mary' as their answer. This was awarded 2/4 marks.

Q8 In this trigonometry question a lot of candidates obtained full marks. The next most common response was calculating 720m – these candidates simply did not seem to recognise that any more was required of them from the question. A few candidates found the distance travelled in one second (4.1m) and ignored the constant speed, gaining 3/4 marks.

Q9 This quadratic equation question was well answered with half the candidates capable of correct factorisation leading to two correct solutions. Some opted to use the quadratic formula, which quite often led to incorrect signs. A significant number of candidates correctly factorised but decided the question had been fully answered at this point, failing to go on to solve the equation. Some recorded $x = 4$ as the only solution by rearranging to get $x^2 - x = 12$ and typically using trial and error or basic arithmetic to figure out that $x = 4$. Others who did find two values occasionally dismissed $x = -3$ as being a feasible answer. Some lost a mark by factorising and getting their signs mixed up.

Q10 The majority of candidates were able to start this linear equation question correctly with a lot of fully correct answers but there were also mistakes made trying to get rid of the fractions. Some candidates made mistakes in working resulting in their answer being a whole number or fraction which meant the maximum they could achieve was 2 marks. Quite a few candidates did not read the question carefully enough and left their answer as 13/3 or 4.3 or $4.\dot{3}$ instead of a mixed number. A range of methods was observed – expressing fractions with common denominator or starting by multiplying the entire equation through by the common denominator, all with varying degrees of success.

Q11 This question on the equation of a parallel line was reasonably well answered. However, quite a few candidates did not realise that they simply needed to change the value of c in order to achieve a correct answer. Some tried to find perpendicular gradients, some used the equation of the line already given in the question and some multiplied the whole equation by 2, resulting in $2y = 6x + 10$, reaping the same result as those who simply restated the original line's equation. Some good candidates stated an answer of $y = 3x + c$ but neglected to specify that $c \neq 5$.

Q12 This reverse percentage question was one of the most successfully answered questions on the paper with the majority of candidates obtaining full marks. The most common mistake was finding 7.5% and subtracting, resulting in zero marks which is typical of this question. Some candidates knew to start with 107.5% = £29455 but could not find 100% from this and obtained 1/3.

Q13 (a) This cumulative frequency question was answered quite well by the vast majority of candidates. Despite the candidates being provided with a grid containing no scale, most managed to draw a cumulative frequency graph which met our expectations, making full use of the vertical axis and scaling the horizontal axis in steps of 10. With no marks available for scales/labels, most candidates achieved

2 or 3 marks here. The most common cause of loss in marks was due to the appearance of multiple lines/curves on the grid, or lines/curves which missed their points completely. Some candidates drew bar charts here, losing all their marks, whilst a small minority plotted mid-point values. Those who found a cumulative set of values from what was already a cumulative frequency table were in a significant minority.

(b) Most candidates correctly read a value from 55 on the horizontal axis, showing clear working out on the graph, but quite a number forgot to subtract this from 160.

Q14 This stratified sampling question was answered very well in general. The vast majority of candidates earned either 0 or 2 marks. The most common mistake was dividing 50 by 5 to get an answer of 10. Only a small number of candidates did not round their answer to a whole number.

Q15 **(a)** In this bounds question most candidates were able to work out the upper and lower bounds of each value but many selected 5.75 and 3.15 here, resulting in an answer of 2.6, rather than the required 2.5

(b) Despite errors in Part (a), many were able to correctly identify the required values as 5.85/3.15 The best candidates recorded their answer in either fractional or recurring decimal format. Those who decided to round needed to do so correctly, leading to many candidates losing a mark for incorrect rounding or truncation. Some used dot notation incorrectly when recording their answer. Quite a few tested out all four possible combinations before identifying the correct answer.

Q16 **(a)** In this algebra question most candidates earned the first mark for the total expression of $16x + 4$ as the perimeter but many then neglected to divide by 4 to get one side of the square. There were a lot of different, unsimplified answers which were acceptable. Quite a few candidates left their answer in the form of an equation rather than an expression. The perimeter of the rectangle equal to $4x$ was a popular answer.

(b) **(i)** This question on setting up a quadratic equation was very poorly attempted with a lot of candidates receiving zero marks as they did not understand what the question was asking and they solved or tried to factorise the equation. Some candidates put the 4 at the wrong side of the equation.

(ii) The majority of candidates were able to solve the given quadratic equation from Part (i) and obtain full marks. A common mistake was an answer of –6 and –2. Quite a few answers were left blank as they didn't understand the question as they thought they answered this already in Part (b)(i) and didn't know what further to write here. Many who used the quadratic formula made mistakes with it.

Q17 In this question on finding the equation of a perpendicular line candidates were able to start the question by attempting to find the gradient of l_1, with most trying to use $\frac{y_2 - y_1}{x_2 - x_1}$. However, this inevitably led to errors in substituting the coordinates in the correct order and in dealing with the negative signs in the question. Some candidates used sketches to find 'rise/run' and one candidate even drew out 1cm square grid lines. Weaker candidates used $\frac{y_2 - y_1}{x_2 - x_1}$ whilst others focussed on finding mid-points. Of those who correctly calculated the gradient of l_1 as 4, quite a few were unable to work out the perpendicular gradient, with –4 being a common incorrect method. The most common way to find the equation of the line was to calculate c using $y = mx + c$, rather than using $y - y_1 = m(x - x_1)$.

The best candidates were able to go on to finish the question having calculated the correct perpendicular gradient. However, there were frequent errors in the working when attempting to calculate the value of c. Follow through marks were allowed throughout this question.

Q18 In this 8 mark question involving finding a shaded area of a sector of a circle only the more able candidates obtained full marks. However, the mark scheme was split well to allow candidates of all abilities to obtain some marks. The vast majority of candidates were able to find the height of the triangle using Pythagoras' Theorem and then correctly find the area of the triangle and therefore obtained 3 marks. A common mistake was finding the area of a quadrant rather than finding the angle using trigonometry.

Q19 This standard question on algebraic fractional equations continues to cause difficulties for a lot of candidates but it was a good question for differentiation of candidates. Most of the very capable candidates dealt with this question with ease. Of those who failed to gain maximum marks, many were able to recognise that a common denominator was required. A recurring error came when expanding the second half of the numerator, with $4x + 16 - 3x + 9$ being seen regularly. Cross multiplying is a widely used method in this question. Some candidates could form the quadratic but did not have the necessary understanding to solve it. Again, quite a few are dependent on using the quadratic formula rather than factorising, despite this being a straightforward quadratic.

Q20 **(a)** In this histogram question the vast majority of candidates were able to find the correct frequencies for the first two marks. A lot of candidates were also able to draw the correct bars to gain full marks. Common mistakes were: not finding the frequency densities and just drawing frequencies for the heights of the bars; drawing the first two bars as one bar, i.e. one bar from 0 – 20; incorrect scale on the y-axis.

(b) This question on finding the median from a histogram continues to cause problems for the majority of candidates with very few obtaining full marks, or even any marks. The majority of candidates were able to find that the median value was the 115th value but could not continue.

Q21 Very few candidates scored full marks in this circle theorems question due to problems in justifying how they calculated angles using the correct mathematical language. This question distinguished the good candidates from the excellent candidates and those who knew their circle theorems well scored at least three marks, with the last mark for recognising alternate angles being the most difficult to attain. Some recognised the angle property which proved the lines were parallel but instead of stating "alternate angles", used "Z angles" or spoke about the shape being a trapezium. The weakest candidates didn't even begin with an attempt at the AST, instead assuming that alternate angles could provide a starting point or by assuming that triangle SPQ was formed by the diameter of the circle, hence angle SPQ would be 90°. Some stated that "opposite angles in a cyclic quadrilateral are equal". Quite a few were able to correctly calculate the missing angles in the diagram but failed to provide adequate reasons, some offering written calculations only. Quite a large number had completely incorrect angles labelled in the diagram.

Q22 Part (a), factorising a quadratic with two variables, was only answered well by a minority of candidates. Candidates usually obtained either 2/2 or 0/2 marks. Most candidates didn't recognise the method even though they correctly factorised earlier in the paper.

Part (b), algebraic factor simplification, was very poorly attempted by the vast majority of candidates. Many candidates could get the first mark by adding the first two algebraic fractions using a common denominator and some could simplify the top line correctly for another mark. The most common mistake after this was expanding the denominator and not seeing the cancelling. Very few of those who did cancel the $(2x - 1)$ went on to cancel the x term. Only the most able candidates obtained full marks.

Assessment Unit M5 Foundation Tier Non-Calculator

Unit Overview

This is the first time this examination has been taken by candidates and it was evident from the range of marks awarded, from single figures to over 40, that a range of abilities were being tested. Most candidates attempted all of the questions and partial marks were awarded in many questions where appropriate method and understanding was demonstrated. There was no evidence to suggest that candidates had insufficient time to complete the paper and a number of questions, such as those towards the end of the paper, provided rigour for the more capable candidates. Many questions allowed for differentiation by ability and the majority of candidates found parts of most questions accessible. It was disappointing to see a significant number of candidates attempting Question 12 (b), on scale drawing, without a ruler or protractor. Mathematical communication is still an area that needs development at this level. Where written explanations or justifications are required to support answers many candidates are unclear or ambiguous in their writing. Weaker candidates were let down on occasion by poor knowledge of basic operations and careless arithmetic. It is also clear that many candidates would benefit from improving their examination technique, for instance rereading the question and checking their answers for reasonableness. Estimation is still not a technique that many candidates at this level are confident with or competent in using and centres could better prepare their candidates for examination by spending more time in the classroom on this important and functional skill.

Q1 It was disappointing to see so many non-estimating approaches to this question on mobile phone charges. Most candidates worked with the given figures and attempted to produce the exact total of £2.36, which a large number were able to find. The minority who did estimate were generally successful and found the correct answer for full marks. Some candidates did not work with consistent units while others failed to change their answer in pence into pounds on the answer line. It was pleasing to note that very few instances of incorrect money notation, such as £2.40p or £2:40, were seen. It is not appropriate to calculate exact values and then round them before summing for the answer.

Q2 This 3-part question on reading dials and gauges was well answered with a significant number of candidates gaining most of the available marks. Common incorrect responses included 34.5 in Part (b), where the scale was misinterpreted, and 300 in Part (c), by taking a careless reading. It was clear that a small minority of candidates failed to read the information given in Part (c) and consequently answered their own question and recorded the pressure as 0 psi because that is where the arrow was pointing.

Q3 Many candidates found the correct answer for the next term in the sequence of coordinates. For those failing to gain both of the available marks 1 mark was awarded more frequently for the '13' rather than the '3', possibly because candidates at this level are more confident dealing with sequences where they add 3 rather than those where they subtract 4. Some misunderstanding of the answer expected was shown by candidates writing down the next two terms of the sequence because the space

to record their answer appeared as (___,___). Others spotted that the sum of the coordinates was decreasing by 1 each time and answered with a pair of coordinates summing to 16.

Q4 Better candidates were able to complete the spinner with the required numbers to satisfy the three probability statements. The most common incorrect response was to use a 4 and two 5s rather than a 5 and two 4s, possibly because of careless reading of the final statement which referenced 'more chance of landing on 5'. Another incorrect response seen frequently was 3, 4 and 5 where candidates just repeated the information already shown on the spinner. For most candidates it was clear that their answers were not being checked against the statements given.

Q5 Part (a) was well answered by many candidates with a significant number of the cohort awarded at least 3 of the 4 available marks for finding the taxi fare and comparing it to £10. Some candidates selected the wrong value from the mileage chart but were awarded follow through marks for appropriate method and reason. For candidates finding the correct fare of £9.60 the final mark was often lost as a comparative statement about the closeness of the fare to £10 was not given. Some mistakes were made when calculating the fare, most commonly when multiplying 90p by 9 or by using an incorrect method, such as multiplying the £1.50 pick-up fee rather than the mileage by 9. For candidates who did not fare so well on this question there was still a mark for sight of 9 which showed they had read the 2-way table correctly. Part (b) was successfully answered by many candidates who produced the correct total cost of £6.79 and then either found the correct change as £3.21 by subtraction or showed that the change given of £2.21 was £1 less than it should have been by addition. Some candidates showed poor addition and subtraction of decimals techniques or were careless in their work and lost marks. A surprising number of candidates were unable to take their total away from £10 accurately. An approach that was frequently seen was to subtract the items sequentially from £10, for instance, 10 – 2.95 = 7.05, 7.05 – 0.89 = 6.16 etc., but this approach rarely led to the correct value of £3.21 being found.

Q6 This proved to be quite a challenging question for many, possibly due to the unfamiliar format in which it was presented. Only a small minority of candidates were awarded the full 4 marks for identifying the various probabilities with the required symbols, though most gained some of the available marks. Parts (a) and (b) were better answered than Parts (c) and (d). Part (b) was the most successful part of the question with many identifying the probability of a 'T' being taken from the word 'COMMON' as •. Parts (c) and (d) were poorly understood with most candidates unable to identify the appropriate symbols, often simply stating letters belonging to the given word.

Q7 This straightforward map and scale question was well answered by many candidates, though it was clear that some did not have a ruler and were unable to do more than estimate the distance between the town and the caves in Part (a). For those that measured the straight line distance with a ruler most were reasonably accurate and if they doubled their measure they were awarded both of the available marks. A number of candidates failed to take cognisance of the given scale and lost the second mark for not converting their length in centimetres into kilometres. A large number of candidates had no problem indicating the position of the buried treasure in Part (b). Those without a ruler were often not hindered in this part of the question as they correctly surmised that the grid was centimetre square. Again, a small number of candidates ignored the given scale, and marked the treasure 6 cm below the town, which they should have realised was off the island.

Q8 Finding the next two terms of the non-linear sequence of Part (a) was well answered by many, though some candidates failed to produce –1 for the final term with zero a common incorrect response. Most candidates failed to recognise 1, 8, 27 and 64 as cube numbers in Part (b) with square numbers or prime numbers common wrong answers.

Q9 Better candidates were able to successfully draw the required conversion graph in Part (a) and use it in Part (b) to evaluate whether Jonah was breaking the speed limit. Again, a number of candidates did not have a ruler but gained a mark if their points were accurately plotted. A minority of candidates ruled a straight line from the origin to (100, 50) in the top right of the grid and received no marks while others produced a bar chart. In Part (b) a small number of candidates failed to understand what was being asked and stated that the speed limit for the road was 50 mph, presumably as the vertical axis went up to 50, and concluded that Jonah was not exceeding the limit.

Q10 This proved to be the most challenging question on the paper with very few marks awarded. Most candidates did not know how to start solving the problem and many simply attempted to subtract the given fractions, ending up with $\frac{5}{12}$ if they subtracted correctly. The correct answer of $\frac{1}{2}$ appeared on a number of scripts without any work to indicate where it had come from. No marks were allowed for answers not following from a sensible method. A minority of candidates were awarded 1 of the 2 available marks for correctly multiplying $\frac{1}{4}$ by $\frac{2}{3}$ as $\frac{1}{6}$ but lost the final mark when they were unable to take this away from $\frac{2}{3}$ correctly. Some candidates earned 2 marks for changing $\frac{2}{3}$ into $\frac{8}{12}$ and finding a quarter of this as $\frac{2}{12}$ which they then removed from $\frac{8}{12}$ to leave the correct answer of $\frac{1}{2}$. One candidate represented this method diagrammatically with a rectangle split into twelfths and received full marks. At this level it was not expected that candidates would use the more direct method of $\frac{3}{4} \times \frac{2}{3}$ and so it proved.

Q11 Most candidates were able to accurately reflect the triangle in the y-axis although many drew their reflections freehand. Candidates should be reminded that they are expected to use a ruler in this type of question. A minority of candidates also drew reflections in the x-axis and were not awarded the available mark. Some candidates were inaccurate with one vertex and were awarded no marks. Checking would have identified the inaccuracy which could then have been corrected.

Q12 It was pleasing to see so many correct responses to Part (a) where candidates were asked to find the missing angle of a right-angled triangle. A number of candidates lost a mark due to poor arithmetic if they were unable to subtract 132 from 180 accurately. Disappointingly, some candidates used 360° as the angle sum of a triangle. Most candidates were able to gain at least 1 of the 3 available marks in Part (b) for making an accurate drawing of the sketched triangle. Many gained full marks for drawings with the base and side angles drawn within tolerance. Some candidates lost a mark needlessly if they failed to 'close' their shape by ensuring that the left and right sides met at the apex of the triangle. A minority of candidates clearly had neither ruler nor protractor and consequently were unable to produce the required accuracy.

Q13 This question on probability was well answered by better candidates. Part (a) required an answer of $\frac{9}{100}$ but this was seen much less frequently than expected. Common wrong answers included 9 and $\frac{9}{375}$ or words such as 'unlikely'. Some candidates failed to read the given information carefully and missed the fact that 100 boxes were tested. These candidates then often incorrectly added 9, 58 and 33 and put 9 over their wrong total. Although clearly showing understanding of the topic since only one mark was available it was lost. Part (b) was rarely answered correctly and it was clear that many candidates had not been prepared to expect this type of question. A small number of candidates who knew the method to use lost a mark due to their inability to calculate $\frac{9}{100} \times 5000$ accurately.

Q14 A very small minority of candidates were awarded both of the available marks on this question testing estimation and knowledge of area. It was surprising to see a large number of candidates work with the perimeters rather than the areas of the given rectangles. No marks were awarded to candidates using this wrong method. Others, again, failed to estimate and attempted to multiply 197 by 33 and divide 54 into their result. No marks were awarded for a non-estimation approach. For those who knew to round to 200, 30 and 50 arithmetical errors, when calculating 30 × 200 ÷ 50, were occasionally seen which usually resulted in the loss of at least one of the marks.

Q15 This question on angles in polygons proved challenging for all but the very best candidates. In Part (a) it was clear that many candidates were unfamiliar with this approach to finding the angle sum of a polygon despite being instructed in Part (i) to find the total of all the angles in the three triangles. There was evidence that some candidates used a protractor to measure the 9 interior angles and added them to the wrong total. Others who knew to multiply 180 by 3 were sometimes inaccurate with their calculation and failed to earn the available mark. Part (ii) was misunderstood by a majority of candidates as answers here generally differed to those given in Part (i), but were mostly still wrong. Few correct responses to Part (b) were seen though some candidates earned follow through marks for knowing to add 360°onto their answer to Part (a)(ii).

Q16 Despite being the final question on the paper a significant number of candidates were awarded the full 3 marks for correctly rotating the triangle 90°clockwise about the origin. One mark was awarded in quite a few cases for correct rotations about a wrong centre and in a small number of cases for an anticlockwise rotation of 90° about the origin.

Assessment Unit M5 Foundation Tier Calculator

Unit Overview

Marks ranged from single figures to over 40 suggesting that candidates across the ability range from grades G to D made up the cohort. The majority of candidates attempted all of the questions and part marks were awarded in many questions where correct method and understanding was demonstrated. There was no evidence to suggest that candidates had insufficient time to complete the paper. Questions frequently allowed for differentiation by ability and the majority of candidates found parts of most questions accessible. It was disappointing to see a significant number of candidates answering probability questions on this paper with words rather than fractions, in particular questions 6, 8, 10 and 13. Mathematical communication is still an area that needs development at this level. Where written explanations or justifications are required to support answers many candidates are unclear or ambiguous in their writing. It was evident that some candidates did not have a calculator for this paper

Q1 This straightforward question on reflection and symmetry was well answered by most candidates. In Part (a) candidates who used a ruler when drawing their reflections generally produced more accurate images. A small minority of candidates were unable to reflect the triangle and translated it to the other side of the mirror line. In Part (b) there was a large number of fully correct responses though the quality of the lines of symmetry drawn in some cases was poor. Candidates should be encouraged by centres to use rulers when answering questions of this nature. The majority of candidates were able to identify the horizontal and vertical lines of symmetry but some missed the diagonal ones. A minority of candidates found the required lines of symmetry but added other incorrect lines.

Q2 Candidate knowledge of imperial units still in common use is poor. However, in Part (a)(i), the required response of mile was frequently seen. The most common incorrect answer given was kilometre. Other incorrect responses for the imperial unit used to measure the distance between towns included yards and miles per hour. Part (a)(ii) was much less successful than Part (a)(i) with few candidates providing pint as the imperial unit of capacity for cartons of milk. Common incorrect responses included litres and gallons. In Part (b) candidates were asked to explain how to change pounds into kilograms. Stronger candidates showed that 1 kg is equivalent to 2.2 pounds but most were unable to produce the required answer of 'divide by 2.2'. Weaker candidates often answered with multiply or divide by 100 or 1000.

Q3 Many candidates answered all three parts of this probability question correctly. Candidates at this level cope well when probability words are required rather than fractions.

Q4 Better candidates, in Part (a), explained that 2 is not a square number or that the first square number should be one. Some candidates stated other numbers such as 4, 9 or 25 were not square numbers or made incorrect statements such as square numbers can't be odd. Many candidates answered Part (b)(i) correctly and found the missing triangular number as 15. A common incorrect response was 14, found when candidates subtracted 7 from 21 rather than realising that they needed to take away 6. In Part (b)(ii) better candidates were able to find 105 as the smallest triangular number greater than 100. Other responses appeared to be guessed rather than based on having examined the part of the sequence shown. This question distinguished between candidates of differing ability.

Q5 It was pleasing to see that many candidates when given the required imperial to metric conversion were able to use it appropriately. In Part (a) the majority of candidates knew to multiply the number of pints by 0.568 and most then produced the correct answer of 6.816 Some careless rounding was seen on occasion and there was evidence that some candidates did not have a calculator and made little progress when using non calculator methods to multiply out the required sum. A minority of candidates failed to use the correct method and divided 12 by 0.568 Part (b) proved more challenging than Part (a) with many candidates applying the same approach they had used in the earlier part of the question and producing the commonly seen incorrect response of 8.52 Better candidates knew to divide and gained both of the available marks for finding 26.4 Again, poor rounding was seen on occasion.

Q6 Better candidates were mainly successful in this question testing probability. Part (a) was well answered by many and the correct response of $\frac{1}{81}$ was frequently seen. Weaker candidates often omitted the fraction and answered unlikely, which gained no marks. Quite a few candidates showed the correct fraction in the workspace but then answered unlikely on the answer line. They were awarded the available mark. Candidates at this level should be aware of the type of response expected in questions testing understanding of probability. Part (b) was a little less successful than Part (a) with fewer correct responses seen. Again words were frequently given though in some cases full marks were awarded if the correct fraction was seen in the workspace. In Part (c) candidates often expressed difficulty communicating their reason. Better candidates realised that there would be an extra odd number so the probability of the winning ticket having an even number would not be $\frac{1}{2}$. Generally, however, reasons given were ambiguous or inconclusive.

Q7 This straightforward question on enlargement was well answered and many candidates gained full marks. Use of a ruler in this type of question should be encouraged by teachers as the quality of presentation of some of the enlargements was disappointing. A minority of candidates used an incorrect scale factor and received no marks. Some candidates lost one or both of the marks for careless work which could have been avoided had they checked their answer. Several responses were penalised one mark if their enlargement was wrongly oriented. Some weaker candidates clearly had little understanding of this topic, often scaling up some of the dimensions but not all and producing longer and taller hexagons with the same width as the original shape.

Q8 Most candidates were able to correctly complete the table of outcomes though some were careless and lost the available mark for wrong entries, which could easily have been corrected if checking had taken place. A minority of candidates added an extra column, for value 4, on spinner B and consequently lost the mark. More careful reading of the information provided would have removed this issue. Parts (b) and (c) proved to be good differentiators of ability with better candidates demonstrating good understanding of probability and gaining the available marks. Less able candidates, however, did struggle with Parts (b) and (c) and many gained neither of the available marks. Again, answers such as unlikely and likely were frequently seen.

Q9 It was clear that many candidates sitting this paper are unfamiliar with ratio and its notation. Better candidates, in Part (a), did manage to produce the correct ratio of 3:2 Candidates, in many cases, who were unable to produce the ratio in its simplest form often gained a mark for showing 36:24 or a partly simplified ratio. Part (b) was only answered correctly by a minority of candidates. Some candidates gained one mark for finding one quarter of 52 as 13 and making no further progress. Many candidates just seemed to arbitrarily choose two numbers that summed to 52.

Q10 Part (a) was well answered by candidates who realised that the table of results only included three colours and that other colours would have been chosen. A minority of candidates did not read the information presented carefully enough and missed the fact that there were no absences on the day the results were recorded, leading to inappropriate answers that referred to 7 candidates being absent. Others concentrated solely on the data given in the table and stated that the reason the total in the table is not 32 is because 12 girls and 13 boys gives a total of 25. A small number of candidates stated the total should be 50, from two lots of 25 in the table. Parts (b) and (c) were again good ability differentiators. A minority of candidates were successful in Part (b) but few correct responses to Part (c) were seen. Words were frequently given by candidates rather than fractions. Common incorrect responses to Part (b) included $\frac{5}{32}$ or unlikely while in Part (c) $\frac{18}{25}$ or likely were frequently seen.

Q11 Many candidates correctly found 60 minutes as the time Ryan was not moving. An incorrect response that occurred frequently was 100, presumably coming from a misinterpretation of the horizontal scale which had the times 0800, 0900, 1000 and 1100 marked. Part (b) was answered well by many candidates who had no trouble taking a reading of distance from the graph at 0930. An incorrect response of 50 was given on a number of scripts where candidates clearly thought an approximation was appropriate. Part (c) was challenging for the majority of candidates sitting this paper with many gaining no marks or the standalone units mark if they indicated a speed in km/h. Only a small minority of stronger candidates produced the correct speed of 43. An alternative approach saw several candidates dividing 150 km by 210 minutes giving a speed of 0.71 for which they were awarded 1 mark. None of these candidates gave the appropriate unit, however, of km/min.

Q12 This 5 mark question on exchange rates and better value was a good discriminator of ability and it was pleasing to note that many candidates were able to access some of the available marks. A variety of approaches were adopted but only candidates who managed to produce the same volumes of suncream in the same currency to enable comparison were awarded full marks if they then answered Belfast. Many candidates were awarded two marks for finding a correct currency conversion or for changing their volume correctly. Candidates who wrote Belfast on the answer line and who had no working to explain their answer were awarded no marks. A significant number of candidates rounded their results inappropriately or truncated them which led to errors being compounded as they progressed through the question.

Q13 Better candidates scored full marks on each part of this probability question. In Part (a) many candidates failed to provide enough work to show that the required method was being followed and consequently ended up with no marks. Candidates often were unable to correctly add the 3 given fractions which they then needed to take away from 1 to find the probability of 'Fail'. It is clear that many candidates sitting this paper are unaware of how to use the fraction button on a scientific calculator. In Part (b) candidates were often unable to correctly add $\frac{3}{10}$ and $\frac{1}{20}$ but in many cases were awarded a mark for correct method being shown. Common incorrect responses included words, rather than fractions or decimals, in both parts of the question.

Q14 This question on transformations was well understood and answered by a small minority of better candidates who gained both of the available marks. Some candidates were able to access one mark for stating 'move 3 right and 2 down' but few were familiar with the term 'translation'. Incorrect responses included 'move 3 across' which was insufficient, or 'move 3 left and 2 up' where candidates mapped triangle B to triangle A.

Assessment Unit M6 Foundation Tier Non-Calculator

Unit Overview

Almost all candidates made a good attempt at answering most of the questions but there is a considerable range of ability at this level and understanding and thus responses varied, particularly for those questions that were challenging in the latter part of the paper. This paper was constructed to allow candidates to be differentiated across the ability spectrum with grades ranging from G to C* and it achieved this purpose. Part marks for correct method and minor arithmetical errors were made available in all questions where possible. The language used was accessible, though many candidates still failed to read the whole question before attempting an answer. There was little evidence to suggest that candidates lacked time to complete the papers and it was good to see almost all working through to the end of the paper.

It was noticeable that new topics on the specification at this level, namely Angle Sum in a Polygon and Binary had been generally well covered in preparation for the examination. A concern was the number of candidates who tried to convert relatively easy fractional probability answers into decimals or percentages, often resulting in rounding errors. Question 6, 'fraction remaining in the bag', proved to be a major challenge for almost all and was only completed by the very best.

Numeracy skills were tested directly and indirectly (through Data, Geometry or Algebra) in Questions 1, 2, 3 (a), 4 (a), 6, 8 (a), 9, 11, 12, 13, 14 and 16.

Questions with a functional element that were reasonably well answered include Questions 1, 4 (a) and (c), 5 (b) and 9, though Question 6 involving fractions posed a major problem for almost all candidates.

Literacy and Communication were a feature of Questions 1 and 5 (b). It was noticeable that weaker candidates continue to find it difficult to articulate their thinking in clear mathematical language.

Q1 This was a good opening question for nearly all, with minor errors made in either the calculation of the total for the 4 items or for the subtraction of their total from £10. Almost all concluded that the change was not correct and acquired at least 2 out of the 3 available marks for a single arithmetical error. Alternative methods to the mark scheme seen included, repeated subtraction from £10 of each item and the addition of the change to the money spent to show that it did not total £10.

Q2 The setting of this question on probability was slightly different from the norm combining the use of symbols with a probability line. The majority adapted well and scored highly with weaker candidates ignoring the symbols and writing fractions for which they were allowed some marks. Part (b) proved to be the best done question on the paper with 91% getting it correct.

Q3 Part (a) was the standard 'continue the sequence' question, with most gaining full marks. A few weaker candidates were unable to subtract 5 from 4 to get –1 and lost the second mark.

Answers to Part (b) however were wide and varied with incorrect answers describing the sequence of numbers given as triangular, square, integers, increasing and even Fibonacci. It was disappointing that they did not recognize cube numbers.

Q4 A wide acceptable range allowed almost all candidates to score marks in Part (a) for either the correct measurement or for the interpretation of the scale. Weaker candidates in Part (b) either failed to use the scale in reverse and marked the buried treasure off the island or ignored the statement that it was 'south of the town' and proceeded to mark it in what they thought might be a good hiding place. Part (c) was very poorly answered. Only the best used the 3-figure format for bearings though many did pick up 1 mark for measuring the angle which would lead to this answer.

Q5 Most plotted the points correctly but still too many failed to draw the straight line which is essential for a conversion graph. The actual correct reading of the graph was not crucial for this question, as they only had to recognize that the speed was in access of 30 but it was worrying that many did not interpret the scale correctly in stating their answers.

Q6 Only the very best gained marks in this question with fractions once again being a mystery to the majority at this level. Candidates failed to appreciate that for part of the solution they had to calculate $\frac{1}{4}$ of $\frac{2}{3}$ which either required multiplication or changing to a common denominator e.g. $\frac{2}{3} = \frac{8}{12}$ and $\frac{1}{4}$ of $\frac{8}{12} = \frac{2}{12}$ $\left(\frac{1}{6}\right)$. A few candidates used a different approach in allowing the coal to have a certain weight to begin and worked out how much was left at each stage – a clever method, if followed through correctly, leading to full marks.

Q7 This question in the main was very well answered with incorrect answers either reflecting the given shape in the x axis or placing reflected triangles in all 3 remaining quadrants.

Q8 Part (a) was very well answered with many getting full marks for the correct answer of 48 or picking up a method mark for knowing to subtract either 132 from 180 or 42 from 90. In Part (b) the main error was the poor use of the protractor to measure accurately the 65°. The most worrying thing was that the majority did not use the starting point Q that was given to ensure the triangle fitted in the sized answer space.

Q9 This type of probability question in Part (a) requires a fractional answer and not just the words we associate with probability. Weaker candidates often fail to appreciate this and common wrong answers were unlikely are very unlikely. Having said that most scored well here but in Part (b) quite a few had answers of 45 and 4500 due to either not being able to calculate $\frac{9}{100}$ of 5000 or mis-reading the 5000 as 500.

Q10 While a number scored 1 mark for making at least two correct moves with this 'rearranging' type question, only the best scored the full two marks. Errors were frequently made in forgetting to change the sign of the term being moved and not appreciating that the y given was in fact $-y$ and needed to be dealt with. In addition, weaker candidates often joined numbers and letters together e.g. $4x$.

Q11 Many candidates ignored the instruction to use 'estimation' and fell into the old trap of working with a method which involved multiplying and dividing with the given values. This of course received no marks. The answer of 176 was very common as candidates chose to calculate for a perimeter and not an area.

Q12 In setting, Part (a) was designed as an obvious lead into the rest of the question but this was only picked up by those who had been taught this method which is new on the specification. In Part (b) those who had learned the formula $(n - 2) \times 180$ or those who calculated the exterior first and multiplied up, were able to calculate the pentagon interior angle total for Part (b). However, trying to get the exterior of the nonagon in Part (c) proved difficult as 360/7 does not work out evenly and often led to rounding errors.

Q13 Many candidates struggled with this inequality question. Common errors included adding the $8x$ and $6x$ rather than subtracting and solving as an equation getting an answer of $x = 3$ instead of the correct answer of $x < 3.5$

Q14 Part (a) of the question was generally well done by all candidates who had been taught this new decimal/binary topic for this module. There were a few however who were mixed up in their method and included a 0 on the righthand side of the correct answer or added several 0's in front, perhaps having met this topic in I.T where they are asked to fill in 0's to the left.

Even though the specification states 'being able to convert decimal to binary and vice versa', certain candidates appeared unaware that all our counting numbers are part of the decimal system and having got 26 in Part (b) felt they had to write it as a 'decimal' containing a decimal point with 0.26 and 2.6 being seen.

Q15 The most common error in Part (a) was to include mention of more than one type of transformation which immediately ruled out any marks for the 'bits' that were correct – this was done by 52% of candidates. Others who didn't gain full marks usually were able to identify it as a rotation, but often gave the wrong direction, left out the 90° angle or forgot to include the centre of rotation. Many gained the 2 marks in Part (b); some however translated as '2 left and 5 down', with a small number translating Q rather than T.

Q16 Relative frequency is a topic which is only understood by the best candidates on this paper, thus its position at the end. In Part (a) 27 was the most common wrong answer, with candidates just taking the 0.27 value and multiplying by 100. Part (b) was a nice one to finish with and it was hoped that this type of question would have been asked many times in the classroom in teaching the connection between probability and expected outcomes.

Assessment Unit M6 Foundation Tier Calculator

Unit Overview

Again, almost all candidates made a good attempt at answering most of the questions and the overall response was similar to the non-calculator Paper 61.

As on Paper 61 a number of candidates tried to convert relatively easy fractional probability answers into decimals or percentages, often resulting in rounding errors. Question 14, 'shade the locus', proved to be a major challenge for almost all and was only completed by the very best.

Numeracy skills were tested directly and indirectly (through Data, Geometry or Algebra) in Questions 1, 2 (a), 3, 4, 5, 7, 9, 10, 11, 12, 13 and 15.

Questions with a functional element that were reasonably well answered include Questions 1, 5, 7 (a) and (b) although Questions 7 (c) and 10 produced more varied responses.

Literacy and Communication were a feature of Questions 2 (b), 3 (c) and 10. It was noticeable that weaker candidates continue to find it difficult to articulate their thinking in clear mathematical language.

Q1 This opener was well answered by many candidates, but what was quite alarming was the number who were not familiar with triangular numbers or were unable to extend this sequence in either direction. 14 was a common wrong answer in Part (a) from subtracting 7 rather than 6 and at the other end quite a few failed to read the question properly and gave answers less than 100 or answers which were incorrect due to poor addition.

Q2 Part (a)(i) was very well answered with 86% of candidates scoring full marks. Mistakes however were made in giving an incorrect rounded value when it would have been much easier just to write the correct three decimal place numbered answer. In Part (a)(ii) the wrong method of multiplying 15 by 0.568 was seen, along with occasional incorrect rounding. It should be noted that candidates using calculators which display a recurring dot failed to appreciate its significance and were giving incorrect answers of 26.4 with a dot over the 4. Some candidates also showed the embedded solutions of $26 \times 0.568 = 14.768$ or $27 \times 0.568 = 15.336$ leading to answers of 26 or 27,with the latter just getting 1 mark.

Part (b) proved difficult, partly because candidates did not know that 1kg = 2.2lbs but mainly due to struggling in how to explain what to do with this value to convert from pounds to kilograms. There was a variety of wrong answers, most commonly, 'you multiply pounds by kilograms', 'you multiply by 100' or 'by 1000'. Some had learnt 5 miles = 8 km and attempted to apply the same conversion to pounds and kilograms.

Q3 This was the first of the probability questions on the paper and it proved successful for the majority. Errors seen in Part (a) were to write $\frac{70}{81}$, $\frac{1}{80}$ or $\frac{1}{82}$ and in Part (b) to calculate incorrectly that there were 10 tickets bigger than 70. In Part (c) most candidates made a reasonable attempt at explaining why the probability of the winning ticket being even was not $\frac{1}{2}$. A relatively small number of candidates gave incorrect explanations including 'there are more even than odd numbers', 'there is one more even than odd number' and numerically incorrect answers e.g. 'there are only 39 even numbers.

It should be noted that quite a few candidates changed the simple fraction answers into decimals or percentages and a few used ratios which is not acceptable.

Q4 Most completed the table of outcomes in Part (a) very well although a few left out pairs or added an extra column for a non-existent 4 on spinner B. Better candidates generally got the next two parts correct with weaker candidates perhaps not being able to work with the table to get the correct fractional answers and guessed answers which were always incorrect.

Q5 This question was well answered with almost all picking up at least the first mark for writing the correct ratio of 36 : 24 and simplifying to something other than the correct answer of 3:2 which had to be given for the full 2 marks.

Q6 Most gained at least one mark for getting 4 vertices correct, with many getting the full two marks available. A few completed a shape with a different orientation and only a small number drew the shape off grid. Those using a different scale factor did not get any marks.

Q7 The first two parts of this Distance/Time graph question were generally well answered though Part (c) did differentiate between candidates with only 4% of candidates gaining full marks here. In Part (a) a number just counted the 3 × 15min squares at the top of the graph as stopping time and failed to notice the single square earlier in the journey. Common errors in Part (c) were using 140 or 75 as the total distance, getting the time in hours incorrect or using minutes rather than hours but giving units still in km/h. Full marks were available for those who changed their answer units to match with a correct calculation in those units.

Q8 Poor reading of the question introduction led to some answering in Part (a) that the reason the total wasn't 32 in the table was because 7 candidates were absent – it stated in the first line that all were present! The most common wrong answer in Part (b) was to write $\frac{5}{12}$ rather than $\frac{5}{18}$ and in Part (c) $\frac{18}{25}$ rather than $\frac{25}{32}$. As in the earlier probability question rounding errors were plentiful for those who tried to convert either of these parts into decimals or percentages.

Q9 Many picked up the first mark for calculating the remaining angles in the triangle as 75° The next two marks were awarded on completing the calculation to get the interior angle in the nonagon as 140°. A number used the exterior angle, 40°, of the nonagon as the interior angle, even though it was obviously obtuse and led to an answer of 245 – again obviously wrong as the angle EDJ was again obviously obtuse. As an alternative approach, a few candidates used a straight line 180 – 75 = 105 and then added the exterior angle giving EDJ = 105 + 40 = 145°. The last mark was only awarded for the correct answer.

Q10 This proved to be a testing question with only the best gaining full marks. However, marks were available to those who could either carry out a correct money conversion initially or the cost of a similar volume. Further marks could only be gained by those who were able to match like volumes in the same currency be it in pounds or euros. The final choice of Belfast only received a mark if this was done. The good thing was the variety of ways of doing it and there was evidence of some excellent work here in considering not just the 100 and 150ml volumes but costs of 10ml, 50ml and 300ml in either pounds or euros. A few even considered successfully the number of ml that could be bought for a pound or euro in both places and were able to reach the correct conclusion from this.

Q11 In Part (a) many candidates knew that they had to work out what was missing by considering what the sum of the fractions in the table was to begin with. It was expected that having access to a calculator would have made this straightforward but on many occasions arithmetical errors from manual calculations led to a final wrong answer. Weaker candidates seemed to have just guessed an answer to this part. Fraction addition was again tested in Part (b), but many coped with this one better.

The most common incorrect answer was $\frac{4}{30}$ from adding the numerators of $\frac{3}{10}$ and $\frac{1}{20}$ to get 4 and then added the denominators to get 30.

Q12 There were two calculations required here to get the mark available and perhaps a mark could have been gained in getting the m^8 on the top line first before a second mark being awarded for the required division by m^2 on the bottom line to get the correct answer of m^6 Past performance would suggest that this would have been 2 marks lost by weaker candidates rather than 1 or 2 gained. The many varied wrong answers given to this question would tend to support this view.

Q13 Weaker candidates who knew nothing about the n^{th} term concept treated this as a missing term in a sequence and wrote –6 in the answer space. A number recognized the difference as being 3 but failed to appreciate the decreasing sequence idea and wrote 3n rather than $-3n$. Only the best had the correct answer of $-3n + 9$

Q14 This proved to be the most difficult question on the paper with 82% of candidates failing to gain a mark. Some acquired the first mark for the correct arc of radius 4.5 and the corner C as centre but only the very best candidates knew to look for the perpendicular bisector of BD.

Q15 This was generally well done and proved to be a nice question on which to finish. This trial and improvement process has been tested many times in the past and it was good to see that many candidates had prepared well for it. Basic errors included failing to see x^3, subtracting 3 rather than $3x$ and not looking for an answer correct to one decimal place, but for a value of x that would give an answer of 11 Those who gave a correct answer of 2.7 and didn't provide a 'test' on which to base their decision lost a mark.

Assessment Unit M7 Higher Tier Non-Calculator

Unit Overview

The paper allowed candidates ample opportunity to gain marks on a wide range of topics. Candidates were able to make an attempt to answer most questions, but throughout the paper opportunities arose for them to demonstrate full understanding or fall slightly short of what was required. Even some of the apparently easier questions early in the paper presented problems for surprisingly many entrants. Differentiation was therefore achieved as required. Many candidates performed consistently well across the varied selection of topics from the specification. On the whole candidates seem to have been entered at the correct level, performing better than GMC61 candidates on questions common to that paper, while not as well as GMC81 candidates on their overlap questions. Topics new to the completion papers (which had previously been on T2 or T3) included bearings, scale drawings and angles of a polygon. The response to these topics was not significantly different than when they appeared on previous module papers. Topics new to this specification included binary numbers and combinations. It was clear that many candidates had a good understanding of these topics, but unfortunately others did not appear familiar with the concepts involved.

Q1 Many candidates were successful in measuring the required angle to an appropriate degree of accuracy, but far fewer added the zero to form a three figure bearing.

Q2 Nearly all candidates evaluated the next two terms of the first sequence correctly and the majority recognized the second sequence as cubes.

Q3 This problem involving fractions of a bag of coal proved too burdensome for the majority of candidates. Although they could add, subtract or multiply fractions, they were generally unable to distinguish which operation was relevant to the given problem. This was a very disappointing response to the use of fractions in context.

Q4 Reflection of the shape in the y-axis was very well done.

Q5 Nearly all candidates could calculate the missing angle in the right-angled triangle and the production of scale drawings of an isosceles triangle was generally of a very high standard.

Q6 Candidates usually recognized the required probability as $\frac{9}{100}$ (occasionally miscalculated as 0.9) and subsequently could calculate the expected number of boxes of the given weight (occasionally making numerical errors in their calculations).

Q7 Those using estimation (as instructed) to work out an estimate for a length were generally successful (with occasional numerical errors once more), but many incorrectly chose to tackle exact calculations, to no avail.

Q8 Many candidates scored full marks on the three linked parts on interior angles of polygons. Some seemed unfamiliar with the idea of totalling all the angles in the triangular component parts of a polygon while others were able to calculate one interior angle but not use this to find the sum of all the interior angles.

Q9 In changing the subject of a formula, the usual algebraic manipulation errors were common, but the majority of candidates were able to complete the rearrangement successfully.

Q10 Many candidates had little difficulty in changing numbers between binary and decimal forms, while a few did not quite remember the process and confused the order in which powers of 2 are recorded. A sizable percentage of candidates were unfamiliar with the concept of binary numbers.

Q11 In this transformation question, most candidates recognized some of the features of the rotation but only a minority could describe accurately the angle, direction and centre of rotation. In Part (b) the translation was usually carried out correctly.

Q12 This relative frequency question, whose concepts have been regularly tested on T6, produced a wide variety of responses. In Part (a) careful reading of the question should have elicited an interpretation of the meaning of relative frequency. It appeared that misreading led to misunderstanding of what was required. In Part (b) most candidates understood and explained the idea of the 'best' estimate from relative frequencies. In Part (c) some candidates tried to use the table (for a biased dice) rather than standard probability for a fair dice. The majority of candidates nonetheless answered Part (c) correctly.

Q13 In solving the inequality, some candidates showed excellent manipulation skills, some made algebraic errors on their progress through the problem, some erroneously simply swapped the values on different sides of the inequality sign, while many solved an equation but could not take their information back into an inequality.

Q14 It was clear that more than half of the candidates had gained a good grounding in the topic of combinations and produced the correct answer quite effortlessly. A few made attempts to list possible combinations, often not methodically enough to gain many marks, and others seemed not to have met the idea of combinations before. On the whole a pleasing response to a new topic on the specification.

Q15 The strongest candidates showed understanding of the meaning of indices, both zero and negative. Over a third could deal with the zero.

Q16 A difficult standard form question proved too high a hurdle for most candidates. The best calculated the correct answer, some nearly got there but for one simple error in standard form notation, while the vast majority scored one mark for knowing to divide by 500000 or no marks for not even getting to that point.

Q17 For those (the majority) with an idea of how to use given probabilities to complete the tree diagram, full marks were often scored. A common error was to place the probabilities beyond the end of the branches.

Assessment Unit M7 Higher Tier Calculator

Unit Overview

The paper allowed candidates ample opportunity to gain marks on a wide range of topics. There were some straightforward questions easily accessible to most candidates, but also more testing problems to encourage differentiation amongst the entry. Many candidates showed an impressive breadth of understanding of the content of the specification for this paper and an ability to tackle unseen problems. In many cases where the complete solution was not displayed, candidates gained a proportion of the marks available by clear demonstration of the method employed. On the whole candidates seem to have been entered at the correct level, performing better than GMC62 candidates on questions common to that paper, while not as well as GMC82 candidates on their overlap questions. Topics new to the completion papers (which had previously been on T3 or T4) included solution by trial and improvement, which elicited an encouraging enough response at this level, and the more difficult topics of direct proportion and problem-solving using simultaneous equations, both of which were beyond the scope of many candidates on this paper.

Q1 Most candidates were successful in writing the required ratio in its simplest form.

Q2 A very large proportion of the candidates were able to draw the required enlargement by scale factor 3.

Q3 The table of outcomes for two spinners was usually completed correctly. A large majority could use the table to find the probability of getting the same number on each spinner and a smaller majority the probability of a bigger number on the first.

Q4 Most candidates gave a valid reason for the number of boys and girls in the table not being equal to the class size. The most common wrong answer involved candidates being absent, inconsistent with the information given. Most were able to give the probability $\frac{5}{18}$ of a girl choosing 'blue' although many deduced $\frac{5}{12}$ from the table rather than the question. The probability $\frac{25}{32}$ of not choosing 'green' was answered correctly by nearly half the entry, with the common wrong answer of $\frac{18}{32}$.

Q5 Nearly all candidates could read a distance from the graph, within an acceptable degree of tolerance, but few could correctly calculate the average speed for the whole journey. Errors included using only half the total distance, ignoring resting time midway, incorrectly reading the time from the beginning to the end of the journey, using 3.30 for 3½ hours or otherwise being unable to work with hours and minutes. For a regularly asked style of question, these errors were disappointing.

Q6 While most of the candidates could calculate the 75° in the isosceles triangle, many calculated the interior angle of the nonagon as 40° which could not lead to a sensible calculation of the required angle. Such candidates might have checked whether their value fitted the diagram. A minority used 140° and successfully completed the required calculation of 145°.

Q7 On this paper this problem on the better value for suncream, bought in different quantities in Belfast and Spain, produced high quality responses, with a wide variety of acceptable approaches to comparing value. Even the weaker candidates were usually able to either convert from one currency to the other or from one quantity to another, although they often could not combine both processes. Part marks were usually awarded for partial method of solution.

Q8 In this probability question, the quality of answer was high, with the majority able to calculate the probability value missing from the table and also the probability of one of two independent events happening.

Q9 This simplification of indices question was correctly answered by the majority of candidates.

Q10 Despite being a regular form of question, the response to finding the nth term of the given sequence was disappointing. Many candidates could highlight the importance of –3 but could not recall how to use it in finding an expression for the nth term. A minority did use ($-3n$) with the wrong constant and a smaller minority gave the correct answer.

Q11 In this locus question, the required arc for distances greater than 4.5 cm from C was very often correctly drawn. Unfortunately very few candidates were able to draw the perpendicular bisector of B and D, in order to gain full marks. The next best answer involved using AC as the borderline for points closer to B than D.

Q12 This trial and improvement question, a regular old favourite from T3 and T4, was generally well answered. Those candidates who nearly gained full marks either omitted to use an intermediate value such as 2.65 to check whether 2.6 or 2.7 was the better answer, or gave an answer to more than the required one decimal place. A few did not adopt the systematic approach favoured by most candidates and gained few marks.

Q13 In Part (a) just over a third of the candidates accurately constructed the required enlargement. A large proportion constructed the correct image in the wrong position, using the wrong centre, or more likely, no centre at all. A small number attempted to use the correct centre but not with the correct scale factor. In Part (b) most candidates simply divided the area of the original shape by 2, not 4, to find the area of the image, even when they had a correctly sized image on view.

Q14 It was clear that many candidates did not know how to tackle s being directly proportional to the square of v. Some used the given values sensibly to find the required factor $\frac{5}{8}$ but did not finally express s in terms of v. Common incorrect approaches, showing some understanding of proportion, involved direct proportion, inverse square proportion or direct proportionality to the square root. Two thirds of the candidates scored no marks on this question.

Q15 Solving a given problem, not by trial and improvement, but by the use of simultaneous equations, proved a step too far for most candidates at this level. While many constructed one equation involving the total value of the coins, unfortunately often a confusion of pence and pounds, few noticed that the total number of coins would produce the other equation '$x + y = 60$'. Overwhelmingly many used trial and improvement, very often arriving at the correct answer, but gaining no marks in this instance.

Q16 A difficult rearrangement of a formula, involving a square root, provided an encouragingly frequent strong ending to this paper for candidates.

Assessment Unit M8 Higher Tier Non-Calculator

Unit Overview

This was a very fair paper and was generally well attempted by the majority of candidates. The first half of the paper was very accessible and it differentiated well between candidates of differing abilities. The second half did present challenging questions to appeal to the more able candidates. In particular Questions 9, 11 and 12 allowed the very good candidates to demonstrate their skills.

Numeracy skills were tested directly and indirectly (in algebraic contexts) in Questions 2, 3, 4, 5, 8, 9 (a). Question 2 on relative frequency saw the majority of the candidates deal well with the multiplication of decimals required. Question 3 dealt with combinations and was answered very well. Question 4 on binary numbers was also answered well. Question 5 required candidates to provide an answer in standard form which did differentiate well. Questions 8 and 9 (a) allowed all the candidates to show their skills in recurring decimals and the evaluation of indices and many secured full marks.

The functional skills required in Question 6 proved to be very difficult with only a very small number gaining the one mark available. Literacy and numeracy were generally handled well with most candidates having little problem in explaining their answers and recording their thinking.

Q1 **(a)** There was a very good response to this question concerning a geometrical transformation. Almost all the candidates gained at least two of the three marks available. Mistakes occurred due to incorrect angle of rotation or quoting the wrong centre.

(b) Virtually all the candidates gained full marks on this translation question. The common mistakes from the weaker candidates were due to wrong signs in one or both of the directions to be moved or translating the wrong shape.

Q2 **(a)** Most candidates gained both marks here. Some struggled with the 300×0.27 calculation.

(b) Again most candidates managed to get the two marks here. Some candidates thought they were being asked which relative frequency was closest to $\frac{1}{6}$.

(c) This was a very straightforward question with most candidates gaining both marks.

Q3 This question was well answered by most candidates with many scoring full marks. Mistakes such as $6 \times 8 = 40$ or 42 were seen and some candidates tried unsuccessfully to apply a probability approach. The weaker candidates produced the answers $6 \times 5 \times 8 = 240$ or $6 + 5 + 8 = 19$.

Q4 **(a)** **(i)** This question on binary numbers was generally answered very well by most of the candidates. Unfortunately some answers had the powers of two in the wrong order.

(ii) Again most candidates were able to produce the correct answer with ease. As in Part (i) some candidates had the powers of two in the wrong order.

(b) Most candidates scored the one mark here by quickly identifying that any number to the power of 0 always gives the answer of 1.

Q5 This question on standard form was the first to discriminate the candidates. The stronger candidates began by dividing 1 by 500 000 to get the decimal 0.000002 and then changing it to standard form. Many tried to change the 500 000 into standard form first but then struggled to produce the 2 on division or didn't divide at all.

Q6 This question proved to be the most difficult of the whole paper. Only one in ten was able to identify the correct answer and even the best candidates dropped this mark. The majority assumed that 0.05% meant 5%.

Q7 **(a)** The tree diagram required was produced correctly by virtually all the candidates and earning three easy marks.

(b) Many candidates had little difficulty in gaining the two marks available. Simple errors in multiplying/adding fractions were common from the weaker candidates.

Q8 Most candidates were able to convert the given decimal into a fraction but a large number were unable to simplify the fraction into its simplest form. Weaker candidates struggled with the transition from the decimal to the fraction.

Q9 **(a)** This question on the evaluation of indices was generally done well. Weaker candidates struggled to find the fourth root of 16 with 4 being the more common error.

(b) A more complex second part of this question discriminated well between the better candidates. Most could evaluate the numerator but only the top candidates dealt well with the denominator. Errors such as 10 or –10 were common.

Q10 This question allowed the candidates to show a variety of methods in reaching their reasons for each answer. Calculating the areas of each shape needed the use of Pythagoras' Theorem (A and C) and the formula πr^2 (B) which then allowed the candidates to identify whether the answers were rational or irrational. The very good candidates picked up three marks with ease. Almost all candidates were able to identify that the area of B was irrational as it used π. The surd √19 in C was also easy to find. The weaker candidates struggled to answer or weren't sure what rational and irrational numbers were.

Q11 **(a)** This new topic about circles and tangents was only really accessible to the better candidates who quickly and concisely produced the required equation. Many candidates seemed to struggle with a 'show' question. Getting the gradient of the tangent for the first two marks was generally answered well but for many candidates it wasn't used. Their next step was to take the equation given and try to back calculate the value of c and then state that they had shown it was correct. Many candidates couldn't find any gradients and many could not show their working at any stage.

(b) This part of the question was very successful in differentiating the top candidates. Forming the required equation which gained the first two marks was seen in many scripts and the subsequent solutions for x were easily achieved. Some candidates forgot to find the y values and others forgot to put the answers in co-ordinate form. Other common errors were seen in the factorising of the quadratic and not using the $-\frac{1}{4}$ value.

A number of candidates attempted to solve the problem by drawing the graphs of the curve and the tangent. Generally the graphs produced were poor and only produced the point (1, 7) which gained one mark.

Q12 This final question was well done by the top candidates. Most candidates who attempted this question realised that the first line required Pythagoras' Theorem. The squares of the sides BC and AC were generally well done and their sum giving the value 60 was seen leading to the correct answer. Many candidates were unable to complete the squares correctly and were only able to earn one more mark.

Assessment Unit M8 Higher Tier Calculator

Unit Overview

This was a very fair paper and was generally well attempted by the majority of candidates. The first half of the paper was very accessible and it differentiated well between candidates of differing abilities. The second half did present challenging questions to appeal to the more able candidates. In particular Questions 9, 12 and 13 allowed the very good candidates to demonstrate their skills.

Numeracy skills were tested directly and indirectly (in algebraic contexts) in Questions 2, 4, 6, 7, 12. Question 2 on a sequence saw the majority of the candidates find the nth term required. Question 4 dealt with trial and improvement and was answered very well. Question 6 on direct proportion was also answered well. Question 7 required candidates to solve simultaneous equations and was well done by many. Question 12 allowed all the candidates to show their skills in probability and many handled the fractions involved very well.

The functional skills required in Question 7 proved to be dependent on finding the correct equations at the outset. Literacy and numeracy were generally handled well with most candidates having little problem in explaining their answers and recording their thinking.

Q1 A large majority of candidates were able to find the correct answer in this opening question. Some candidates correctly evaluated the numerator but then divided by 2 instead of subtracting.

Q2 Almost half of the candidates were able to produce the correct answer for the nth term. Common wrong answers were $n - 3$, $n + 3$, $3n$, -3 and -6.

Q3 Very few candidates scored full marks in this question. Most candidates scored one mark as they correctly drew the arc of length 4.5 cm. The second mark was for constructing the perpendicular bisector of the line DB and only a small number of candidates were able to do this. The most common error was to draw the line AC and then shading a correct section to be allowed two marks. A few drew the angle bisector of the angle BCD and with correct shading were also allowed two marks.

Q4 This question was very accessible to almost every candidate and a large majority scored full marks. The most common error occurred when the candidates did not test the value 2.65 or (2.66) to verify the final correct answer. A small number had difficulties in calculating the values as they used x^2 rather than x^3. Weaker candidates were unable to organise their work and did not produce all the correct values required.

Q5 This question on geometrical transformation was very well answered with two thirds of the candidates earning full marks. The most common mistake was not giving the correct centre.

Q6 Nearly half the candidates scored full marks on this question on proportionality. Errors occurred in arithmetical calculation of the constant, leaving the proportion symbol in the answer and misusing the proportional type (e.g. omitting the 'square of', using inverse proportion etc.)

Q7 This question was the first to discriminate the better candidates. The top third were able to establish the required equations and solve them simultaneously. Many candidates did not realise that 60 coins would produce an equation. Others unfortunately used a mixture of pence and pounds and the remainder simply used trial and improvement despite being told it was not a method that would be accepted.

Q8 This question on changing the subject of a formula was generally well done. Candidates who started by squaring both sides invariably gained full marks. Those who attempted other routes generally got lost and scored nothing.

Q9 This higher level question differentiated well between candidates. Any who used the cosine rule correctly and the given area formula were able to pick up five easy marks. Those who made errors in the cosine rule could still pick up four marks. Candidates who only used the sine rule generally received no marks. The weaker candidates who tried to use basic trigonometry or assumed angle DCA was 41° or that triangle ABC was right angled gained no marks.

Q10 Many candidates were able to recognise the correct transformation required. Many struggled to identify either that it was an enlargement or the scale factor was $-\frac{1}{2}$ or the centre was (1, 1). Despite the emphasis that there was only a single transformation many candidates recorded two transformations and scored no marks.

Q11 **(a)** Just under half the candidates were able to deduce which graph represented which relationship.

(b) Over half gave the correct answer here. The most frequent incorrect answer was zero.

(c) 40% correctly selected a value in the range $0 < d < 1$. Many gave negative answers here incorrectly.

Q12 This probability question allowed the candidates to gain seven marks with many achieving this total with ease.

(a) Almost 60% of the candidates correctly gave the required answer. Quite a few candidates did not recognise that the question dealt with the fact that the socks were not replaced. Here this meant that no marks were given but some follow through was possible in Part (b)

(b) Again the top candidates were able to select the correct combinations, identify the relevant probabilities and total correctly to get all the marks. Some gave only three of the six possible combinations and gained some marks.

Those candidates who replaced the socks were able, with correct combinations, to gain three marks out of the five available.

Q13 **(a)** Many candidates were able to draw the curve of the required quadratic between the given limits. Marks were lost if the points were joined by straight lines or points were omitted.

(b) This new part of the syllabus was not done well with just over a quarter of candidates gaining full marks. Even when tangents were drawn, candidates often had difficulties in measuring the length and height required.

(c) This question caused many problems mostly because the candidates could not deal with the fact the equation had a $2x^2$. Only 4% managed to produce the answer required.

(d) Many candidates were able to answer this part.

Quite a few produced $y = 14x + 1$ for one mark.

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