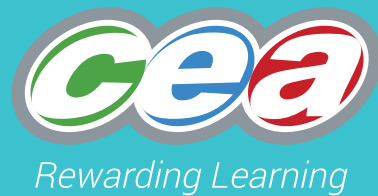


GCSE



Chief Examiner's Report Mathematics

November Series 2022



Foreword

This booklet outlines the performance of candidates in all aspects of this specification for the November 2022 series.

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

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

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GCSE Mathematics

Chief Examiner's Report

General

Despite the disruption experienced during recent years this suite of papers provides evidence of moving back towards the normality prior to 2020. It is clear that teachers and pupils have been working hard in preparation for GCSE Mathematics and were as ready as could be expected for the early testing in November. The papers proved a good test for the candidates at all levels of entry with an acceptable incline of difficulty which allowed nearly all to make meaningful attempts at questions throughout the papers, while providing opportunities for the more able to distinguish themselves and gain the higher grades available at their chosen level of entry. The standard of answering was in general good, with some outstanding performances on each paper.

Assessment Unit M1 Foundation Tier

Unit Overview

This paper had a good range of questions to match the differing abilities of the candidates. Most questions were attempted by all the candidates with only the highest grade questions at the end too challenging for the weaker candidates to make much headway. Some candidates had difficulty when asked to explain in several questions. The level of language seemed appropriate for the candidature and lack of time did not appear to be an issue for candidates.

- Q1** About two thirds of the candidates were able to write down a multiple of 7 between 30 and 40. While many clearly understood the meaning of factor in Part (b), most were not able to interpret the significance of the word 'only' in the question. Many recognized 1 or 4 as square numbers, but less than half selected the correct pair of square numbers.
- Q2** The majority of candidates gained some marks in describing the properties of a trapezium, but very few named the shape correctly and listed all four properties correctly. This question was not as well answered as expected.
- Q3** Most candidates made a good attempt to complete the tally and frequency columns, although some made minor numerical errors and some misinterpreted the word 'frequency'.
- Q4** This question on the use of decimals was generally well answered.
- Q5** Most understood the word 'modal' but a minority gave the value rather than the group. Reasonable interpretation of the pictogram was evident but minor misreading was common enough.
- Q6** Most candidates were able to calculate the total cost from the given word formula but less than half could calculate the 30% asked for in Part (b) and there seemed to be too many words in the question for the majority of the candidates in Part (c).
- Q7** Most of the candidates knew which part of the net of the cuboid would be the top when folded; about two thirds could indicate which corners would touch, but less than half could offer a good explanation of whether the net was of a cube or cuboid.

- Q8** The common error for a minority of candidates in Part (a) was poor use of money notation, mistakenly giving an answer of £7.5. Only the better candidates were able to deal with the problem of percentage and discounts in Part (b), but many more calculated the hourly rate of pay correctly in Part (c).
- Q9** This question on metric units was generally well answered, while differentiating to some extent across the ability range.
- Q10** About two thirds of the entry were able to answer the questions on negative temperatures in Parts (a) and (b) and a straightforward insertion of brackets in Part (c)(i), but the more difficult part Part (c)(ii) proved more testing to all but the best.
- Q11** While a sizable minority measured the angle correctly in Part (a), common problems were the lack of a protractor, reading 140 instead of 40 or misinterpretation of the question to give a right angle as the answer. Slightly more candidates estimated the height of the tree satisfactorily in Part (b), but some did not read the question carefully enough to use the height of the drawn man as a guide.
- Q12** The majority of candidates read the graph accurately in Part (a) but only a minority could use it to find the cost difference in Part (b). Some who misread the scale in Part (a) were able to demonstrate the correct method for answering Part (b).
- Q13** Nearly half the candidates gained full marks in Part (a) for calculating the mean while a significant minority erred only by rounding their answer. While most candidates made a reasonable effort to complete the bar chart in Part (b), many were not accurate with all bar heights. Just over half the candidates were able to give a meaningful interpretation of the bar chart in Part (c).
- Q14** Nearly all candidates struggled to express 2.5% as a fraction with 100 as denominator, although many gained one mark for doubling their wrong value to give the equivalent fraction with 200 as denominator. The strongest candidates were also able to express $\frac{1}{20}$ as a fraction with 2 as numerator.
- Q15** Generally a poor understanding of angle properties was exhibited in this question. Just over half of the candidates could not subtract 130 from 180 to find the 'other' angle on a straight line. Just under a quarter were able to do this and also use the properties of an isosceles triangle to calculate the 'third' angle.
- Q16** Mixed understanding of completion of a pie chart was demonstrated in Part (a) with the majority of candidates not even calculating any of the angles required, although about one fifth gained the full three marks for an answer drawn within tolerance. Conversely the majority were able to gain the full two marks in Part (b) for calculating the full income from the table of numbers of tickets sold at various prices, although a common error was the calculation of 3 free tickets as $3 \times 0 = 3$. As expected, the more challenging Part (c) differentiated amongst the entry and only the better candidates were able to explain why a given statement about numerical data was incorrect, or even realised it was incorrect.
- Q17** About a third of the candidates could write 5872 correct to 1 significant figure; about a fifth found the cube root of 343, while a calculation involving a square and a square root was completed by over 60% and correctly rounded by nearly 20% of the candidates.
- Q18** The complicated timesheet was too much for half the candidates to make a meaningful start. A small number gained the full four marks, but most who made any headway scored one or two marks only for partially correct answers.

- Q19** Just over half the candidates were able to change the rate of strawberry picking per five minutes to the rate per hour, but a large majority were unable to gain marks in the quite testing problem involving the average picking rate for eight workers and a large order for strawberries. A significant minority correctly calculated 7.25 hours but wrote their answer as 7 hours 25 minutes.
- Q20** Just under half the candidates gained marks for simplification of an algebraic expression, with nearly a fifth gaining both marks for a completely correct answer. Most candidates made no progress with the solution of the equation in Part (b).
- Q21** Very few candidates at this level were able to calculate the annual percentage interest rate in this question, although some gained a mark by calculating the amount of interest earned.
- Q22** Only the very strongest candidates gained full marks in this difficult question on areas. Even the introductory calculation of the area of a triangle was very poorly answered.
- Q23** Interpretation of the scatter graph was reasonably well answered. Most recognized the highest mark but too many gave the applicant's identity (H) rather than the mark (49) asked for. Over a third were also able to find the candidate with a total of 80 marks.
- Q24** This question tested the candidates' understanding of the calculations which can be made from a stem and leaf diagram. Over a third drew a sensible conclusion about the modal value and over a quarter about the median, although only 15% made the correct deduction about the range.
- Q25** While many could calculate either one third or 33%, not many appreciated the difference between them.
- Q26** Unsurprisingly, this question on fraction addition proved the most difficult for candidates at this level, with marks being very rarely gained.

Assessment Unit M2 Foundation Tier

Unit Overview

Most candidates were able to attempt all questions, with little evidence of having insufficient time. The standard of written work was good, with clear methods shown, allowing many to access some marks in questions where their final answer was incorrect. There is an issue when candidates show working below the answer line and outside the spaces provided.

A significant number of candidates did not have the correct equipment for the examination which was evident in the very poor quality of some attempts to draw the pie chart. Teachers should remind candidates in advance of the equipment required and ensure they have it on the day.

Use of correct money notation was required in several questions, and it remains a concern that a significant minority of candidates are unable to correctly write down an amount of money, either failing to ensure their answer has two decimal places or using incorrect units.

- Q1** This was designed to be a straightforward start to the paper, but it proved more difficult than expected. Some candidates appeared to have little knowledge of how to convert one metric unit to another, resulting in seemingly random choices of units that could not possibly be correct. Those who knew what they were doing tended to get them all correct, although this was less than half of all candidates.
- Q2** Part (a) was generally well done, although incorrect money notation was evident in a number of cases. Candidates lost marks in Part (b) for failing to answer the question, which asked them to say whether or not the statement was correct. There was a common lack of understanding of how the discount worked, which could be an area of focus for future teaching. Part (c) was straightforward, with incorrect money notation the only common issue.
- Q3** The only common error in Part (a) was writing -8 , which was not accepted. Part (c) (ii) caused issues, with few candidates correctly realising that the bracket needed to contain three terms rather than two.
- Q4** Candidates who had a protractor were able to attempt Part (a), although some were unable to use it correctly and gave the supplementary angle. There was evidence that many candidates realised that the tree was five times as tall as the man, but did not know what to do with that knowledge, often giving 5 as the answer.
- Q5** In Part (a), marks were only awarded when candidates attempted to divide, not just for getting the total correct. Most made a good attempt, although some numerical errors were evident, often with division by seven rather than six. It remains a concern that so many candidates think they need to round a decimal answer to a whole number, resulting in the loss of the final accuracy mark. The scale in Part (b)(i) proved difficult to interpret for some candidates. There was evidence in part (b)(ii) of candidates failing to read the question fully, giving an answer of 'Carla' or 'Rick' when they were asked to give an answer of 'higher' or 'lower'.
- Q6** This graph contained a similar scale to the previous question, again resulting in some candidates being unable to correctly interpret it. It was pleasing that many who got the answer to Part (a) wrong were still able to show clearly how to do Part (b) correctly and gained full marks on follow through.
- Q7** Part (a) was poorly done, with very few candidates realising that the first box needed to contain a decimal. Many did pick up the second mark for doubling their first answer. Part (b) was slightly better, but still had a lower than expected success rate.
- Q8** It was disappointing that a large number of candidates failed to score any marks on this question, despite angle A simply relating to use of angles on a straight line. While some only got angle A correct, the majority of those who did went on to correctly work out angle B.
- Q9** A surprising number of candidates failed to score any marks in Part (a), perhaps failing to realise they needed to work out the angles as there was no blank column in the table. Some drew the pie chart using freehand lines, demonstrating a lack of either a protractor or ruler. Part (b) was well attempted and generally correct, but many candidates incorrectly thought that the statement in Part (c) was correct because 12 is half of 24.
- Q10** Only a small percentage of candidates got full marks in this question. In some cases candidates were unable to even work out the time intervals, with an additional hour for each one being a common error. Half an hour was often converted to 0.3 and many appeared to have no idea what time and a half meant. Given the functional nature of this question, this is an area for future teaching focus.

- Q11** Both parts of this question were reasonably well done, with a significant majority of candidates getting Part (a) correct. The main issue in Part (b) was failure to realise that 7.25 hours is 7 hours and 15 minutes rather than 7 hours and 25 minutes.
- Q12** Part (a) highlighted some weakness in the ability to deal with negative numbers. Less than one in five candidates got Part (c) correct, with three quarters failing to score even the first method mark. This was a straightforward question on equations with letters on both sides, so this is another topic that would benefit from additional teaching and practice.
- Q13** The main issue here was incorrect rounding. Some candidates rounded to the nearest whole number or to 2 decimal places. Many were able to get the calculator answer correct and secured the first mark.
- Q14** There is clear evidence that many candidates are unable to find the area of a triangle correctly. Of those who did, some lost the final mark for not stating units. As a result, Part (b) was very poorly done, although some candidates did gain a mark for finding the area of the path and the patio, which were both rectangles.
- Q15** The most common error in Part (a) was stating the letter of the applicant rather than the mark they obtained. A lot of the best fit lines were unsuitable as they did not have roughly equal numbers of points on either side.
- Q16** Failure to read the question carefully was evident here. Candidates were asked to state which player would make the relevant statement correct. Some performed calculations, but did not commit to an answer that confirmed they knew which was the correct player.
- Q17** Most candidates were able to secure at least one or two marks for working out the savings correctly. However, a significant number then went on to say that shop A offered the greater saving when, in fact, it was shop B. There was evidence of a lack of understanding of what one third is, with some opting to find 30% or 33.3% rather than just dividing by 3 to find the discount.
- Q18** This was very poorly done, with only a small number of candidates securing full marks and almost all scoring no marks. There was clear evidence that candidates used a calculator despite the instruction not to do so.
- Q19** As tends to be the case, this factorisation question was not well attempted. In Part (a) a common error was to take out a factor of 2 rather than 4. Correct answers were rarely seen for Part (b), with little evidence of any understanding of the fact that when r was taken out there needed to be a 1 inside the bracket.
- Q20** There was little evidence of any valid method being used with some of the correct answers seeming to be more by luck than by design. This was underlined by the fact that some were able to get one value correct, but not both.
- Q21** Candidates who failed to realise they needed to multiply the 5 by 4 were unable to access any further marks. There was evidence of candidates using a trial and error approach, as well as many who showed the embedded answer in their working, rather than a systematic method.
- Q22** The majority of candidates did not make any valid attempt at this question, failing to even work out three fifths of the original height. Some, once they had obtained this, simply repeated the same subtraction. Of those who were able to find the correct heights, some failed to give an answer of yes or no.

- Q23** Some candidates were unable to distinguish between a factor and a multiple in Part (a), although the most common error was giving 2 numbers of which 8 was a common factor, but not the highest one. There was little evidence of method being shown in Part (b) suggesting many candidates used their calculator to give the prime factor decomposition, or did not know what to do here. There were more correct answers than in Part (a).
- Q24** Only a very small number of candidates got this question fully correct. Around half were able to access at least the first mark for correctly finding the volume. Common errors were doing the division the wrong way round and failing to include units with the answer.
- Q25** Candidates tended to score all or nothing in this question. Those who realised they needed to use Pythagoras' Theorem tended to get the correct answer, but the majority of candidates did not, and scored no marks. This is disappointing given that the right angled triangle was drawn on the paper. Many candidates just added the two values given in the question, which could not possibly have been worth 3 marks.
- Q26** A very small number of candidates scored full marks in this question, with half failing to score any marks at all. This was surprising, given that the first mark was for finding the area of a rectangle. The formula for area of a circle was not used correctly, with many candidates using the diameter instead of the radius. Correct calculation of the area of the rhombus was rarely seen.

Assessment Unit M3 Higher Tier

The performance by candidates on this paper was generally good with most scores bunched in the middle band of 55% – 75% which appears somewhat higher than previous series. Several candidates secured very high scores and there were fewer very low scores. Most candidates appeared to have been entered at the correct level. There seemed to be enough questions accessible to candidates of differing abilities with varying levels of challenge to make this a positive exam experience for all.

There was a positive response to most Number questions and also Geometry and Measure was well approached. Algebra topics earlier in the paper were well answered but performance on Algebra dipped after Question 12.

Question 17, Question 21 and Question 25 had a limited number of complete solutions, answered correctly by only the very best candidates. Questions assessing Data Handling were successful for many across a range of topics.

Numeracy skills were tested directly and indirectly (through data, geometry or algebra) in Questions 1, 3, 5, 6, 7, 8, 11, 15, 16, 17, 18, 20 and 23. Questions with a functional element on this paper proved great differentiating questions, to include Questions 4, 5b, 8, 11 and 20. Whilst all candidates made good attempts at each of these individual questions, it was only the best who secured full marks on them all. The practical aspects of rates of pay in Question 4, conversion of decimal calculator values to correct time values in Question 5b, accurate conversion of the fraction $\frac{1}{3}$ to a percentage in Question 11 and the multistep aspects of the areas in Question 8 and Question 20 challenged many in reaching complete and accurate solutions. Literacy and communication was a feature of Question 2c where most were able to articulate their reasons for the statement being false. There was perhaps some evidence of misinterpretation in Question 10 where some weaker candidates recorded answers of Yes or No rather than identifying the correct player.

Evidence suggests that candidates had no difficulty completing the paper in the allocated time.

- Q1** Finding the angles within the triangle provided an easy opening question for nearly all. The majority found the adjacent angle correctly with many also proceeding to find the second angle correctly. Occasionally, there was an error in the positioning of the equal angles within the isosceles triangle meaning the second angle was calculated incorrectly.
- Q2** Completion of the pie chart in Part (a) was successful for many. However, there was still evidence that some candidates who were able to compute the angles in the table were then not equipped with a protractor to draw the associated diagram. Finding the total income in Part (b) was very well answered. There was a mixed response in Part (c) but this proved a good discriminator question between those who understood the total of the medium drinks to be 36 and so the argument presented was incorrect and those who saw the 24 and 12 and agreed with the given statement.
- Q3** Calculator operations and rounding proved successful for most. Where an error was incurred, it was generally through truncation rather than correct rounding to 1 decimal place.
- Q4** The time sheet question produced a wide variety of approaches and responses. In general, most candidates approached the question using each day as a separate calculation. Fewer dealt with weekdays and weekends as complete calculations. It was surprising to see how many struggled to calculate all the time periods accurately. Other challenges were in dealing with the time and a half for weekends with many interpreting that there was a single £6 added on to the daily total for Saturdays and Sundays rather than to the hourly rate for those days. Dealing with the additional £18 for the split shift was understood by most. Overall, this question distinguished well between candidates of varying abilities with the full range of available marks being secured dependent on the approach and accuracy presented.
- Q5** Nearly all secured the mark in Part (a). However, in Part (b) only the best achieved both available marks. Whilst nearly all recognized the need for division, the calculated value of 7.25 was almost always recorded as 7 hours and 25 minutes with the decimal conversion of 0.25 hours to 15 minutes not recognized by many.
- Q6** Substitution into the given formula yielded a disappointing response. Too many simply ignored the fact that b was negative. For those who did use the negative b value, many still did not compute the calculation accurately. Some seemed to struggle to understand that ab on the numerator meant a times b . Others who did compute accurately within the workspace then felt there was a need to omit the negative sign on their answer line.
- Q7** Simplifying the algebraic expression in Part (a) was generally well answered with many getting both marks whilst others achieved part marks with one of the two terms correctly recorded. Multiplying out the brackets in Part (b) was also well answered. Solution of the linear equation with variables on both sides proved much more problematic than normally seen at this level. Many struggled to get the variables and numerical terms both isolated correctly. Often, there was an oversight in the equals with many leaving their final answer as an expression, involving letters and numbers.

- Q8** When Part (a) was interpreted correctly many secured the full marks. Occasionally candidates went too far and gave the total area of the 4 triangles. Unfortunately, there were a lot of candidates who saw the right angled triangle and proceeded to apply Pythagoras' Theorem rather than the requirement to calculate the area of the triangle. Many secured the units mark for area being squared with or without the correct calculation. In Part (b) there was a mixed response. Many dealt with the complete rectangle with evidence of the patio and path calculations but did not relate back to the triangular areas for the plants. Again, this meant a range of marks were accessed here by candidates of varying abilities.
- Q9** In Part (a) a significant number recorded their answer as candidate H rather than the highest score numerically as requested. Part (b) was straightforward for most. Positioning the line of best fit in Part (c) yielded a mixed response. Many felt the need to have the line going through the origin, whilst many others positioned the line through many of the lowest points and so did not secure the mark.
- Q10** This was a novel way of assessing stem and leaf and produced a mixed response. Many understood all the requirements and secured the 3 marks. However, many did not read what was asked and simply attempted calculations of the mode, range and median of the given values. There were also a significant number who misinterpreted the question and simply recorded answers of Yes and No in the answer spaces.
- Q11** Comparing the two discounts often lead to either full marks or half marks. Very many reached the correct conclusion, with a few confusing the final comparison by recording A was cheaper, despite having the correct numerical calculations recorded. Those achieving half marks were unable to convert $\frac{1}{3}$ to an accurate percentage, with many truncated values being used.
- Q12** Part (a) on the various types of factorization differentiated well between candidates. In Part (i) many answered correctly with the occasional candidate not extracting the highest common factor. Many dealt well with the repeated r values in Part (ii) although some did struggle with the inclusion of the 1 needed in the final bracket. Whilst very many did recognize that Part (iii) was assessing the difference of two squares many recorded the terms in reverse and seemed unfamiliar with the question set with the numbered term first. Solution of the quadratic equation in Part (b) was only successfully answered by a limited few. This question seemed to be all or nothing for most. Where the requirement for quadratic factorization was acknowledged many secured full marks. On occasion whilst fully factorized some failed to solve the equation to find the values of y whilst others who had the two correct y values then ignored the negative and only placed the positive value on the answer line. It was more common to see the incorrect approach of trial and error or an attempt at incorrect algebraic simplification.
- Q13** In Part (a) there was a very mixed response to drawing the straight-line graph and a variety of marks were awarded. The better candidates had no problem drawing the accurate straight line by either the intercept and gradient approach or by setting up a table of values and calculating a series of correct points. Some plotted correct points but did not complete by drawing the line. A significant proportion of candidates seemed to understand the significance of the point (0, 3) as the y – intercept but then did not appear to know how to proceed. Very many drew a positive sloping line through (0, 3) with others simply drawing a horizontal line through (0, 3). Recording the equation of a parallel line in (b) was only understood by the better candidates.

- Q14** The ability to apply the inverse operation for the midpoint was either fully understood or not at all. For those who approached it correctly, the full 3 marks were generally secured. The most common incorrect response was simply to calculate the midpoint of the two given sets of coordinates.
- Q15** The repeated proportional change question produced a mixed response. There were many who answered the question successfully to achieve all 3 marks. Some weaker candidates simply converted $\frac{3}{5}$ to 0.6m and repeatedly subtracted. Despite a diagram and the final requirements of the question asking them to compare with $\frac{1}{2}$ m some approached by increasing each time. Their increasing calculations should have alerted them to their misinterpretation.
- Q16** In Part (a) finding two numbers with a HCF of 8 was not as straightforward as expected. Very many gave 2 factors of 8, whilst others chose two values such as 16 and 32, which had a common factor of 8 but not 8 as the highest common factor. It was apparent in Part (b) that the calculator function for prime decomposition is recognized now by more candidates. This was evident through many correct answers without the individual divisions within the work. Generally, this was a well answered question.
- Q17** Formation and solution of the linear equation proved problematic for most candidates. This question certainly distinguished the most able candidates who had no difficulty in setting up correctly, solving and proceeding to solve the problem posed. Too often, candidates simply approached the question numerically. It has to be highlighted that formation and solution of a linear equation is a higher level assessed skill and so inclusion of a correct linear equation was necessary to achieve marks. Some candidates did approach via simultaneous equations and whilst this is not a requirement of M3, where they successfully reached a single linear equation and solved, merit was given.
- Q18** Calculation of density produced varying levels of success. The fact that the formula had been given in the supplementary formula sheet helped many gain the full 3 marks. However, there were some who did not use the additional aid to full benefit, and they inverted volume and mass to give a final solution of 5. It was disappointing to see some candidates at this level unable to calculate the correct volume of the cuboid.
- Q19** The straightforward application of Pythagoras' Theorem either led to full marks or no marks. For those who recognized the method, generally full marks were gained. However, it was disappointing to see the number of candidates who failed to recognize the topic being assessed and simply added the two given sides.
- Q20** The multistep area calculation here proved a very successful assessment question. Unless a candidate simply did not attempt the question then there was the potential to score the full range of marks from 1 to 5 and this meant this was a very good differentiating question. Most were able to accurately calculate the rectangle area, the circular calculation was better answered than normal with again the additional formula aids supporting candidates, but it was only the best who knew how to calculate the area of the rhombus correctly and hence bring the problem to a full and accurate solution.

- Q21** The identity proved challenging for many but there were varying levels of success allowing part marks to be awarded. For those who approached algebraically, many achieved either 1 mark for correctly squaring the brackets or 2 marks for squaring and gathering terms but only the very best compared the final terms on the right and left to secure the final mark for $a = 3$. There were also those who approached numerically by substituting in a particular value for n . There were some but probably fewer correct answers from this method. Weaker candidates struggled to even begin this question and it was probably the question on the paper that exhibited most blank responses.
- Q22** Whilst reverse percentage questions are a standard M3 style assessment question, the slight twist of an extra dimension in this question proved problematic for many. As a result, success on this question was limited with candidates usually either scoring full marks or no marks. For those who immediately identified $306 = 85\%$ there was no difficulty in bringing this question to an accurate solution but very many did not begin with this opening interpretation.
- Q23** There was a limited understanding of the requirements of the bounds question. Some did not know to find the lower bound before any calculation and proceeded to simply square 8.3m. For those who did identify the lower bound of 8.25 some omitted the calculation to get area whilst others did find the area but then proceeded to round their final answer. The best understood how to find the lower bound, square and record their full final answer. Hence this question produced a range of marks of 0, 1, 2 across candidates of different abilities.
- Q24** The fact that the opening two values had been given in the cumulative frequency table helped very many proceeding with this question. In Part (b) there were the usual errors of plotting at the lower bounds, or at the midpoints or plotting and not joining the points but in general there was success for many. In Part (c) reading of the median in Part (i) was well attempted but in Part (ii) there were misinterpretations in identifying the 27 correctly on the horizontal with misreads of the scale and then those who read correctly but forgot to subtract their reading from 80 to find the more than aspect. Overall, cumulative frequency was well attempted by the vast majority entered at this level.
- Q25** Finding the equation of the parallel line from the given pairs of co-ordinates was only successfully answered by the best. Weaker candidates seemed totally unfamiliar with this style of question. Others used either a diagram or the formula to attempt to calculate the gradient – occasionally the gradient formula was quoted incorrectly. For the final 2 marks recognition of the equation using an equal gradient but a different intercept was only successful for the most able – too many used the same intercept and quoted $y = 3x + 2$

Assessment Unit M4 Higher Tier

Unit Overview

The performance of candidates in this paper ranged from excellent to poor, with many candidates achieving 50 and above and a small percentage of candidates scoring below 20.

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. The questions that stretched the more able candidates were Questions 4, 8, 19, 20, 22 & 23.

Questions/topics which seemed to cause most problems in general were Question 4 (forming and solving a linear equation), Question 8 (reverse percentages and fractions), Question 15 (setting up and solving a quadratic equation from a Venn Diagram), Question 19 (a reasoning question on Circle Theorems), Question 20 (solving an equation with algebraic numerators and denominators), Question 21 (stratified sampling), Question 22 (interpreting a histogram and in particular finding median and IQR), Question 23 (simplifying algebraic fractions with addition and division).

Candidates should be reminded that if they leave multiple solutions to one question without writing an answer in the answer line then the worst solution is marked. Candidates must make it clear which solution they are using for each question.

There were no issues with completing this paper on time or leaving too many questions blank or not attempted.

Several markers commented that it was evident there were a lot of candidates entered for M4 who would have been better suited sitting M3.

- Q1** This question on finding a fraction of an amount three times to check if a statement is correct was answered well by the majority of candidates. A small number of candidates found the height of the ball after two or four bounces. Some candidates misread the question and found $\frac{3}{5}$ each time rather than $\frac{3}{5}$ which resulted in a maximum of one mark. A small minority of candidates subtracted $\frac{3}{5}$ from each value and gained no marks.
- Q2** In general, this question on finding one of the coordinates given the midpoint and the other coordinate was answered quite well. The majority of candidates who did not gain full marks obtained zero as they were usually using the given coordinates to find a midpoint. Some of these candidates got one correct ordinate and made a simple numerical error with a correct method for the other ordinate, resulting in two marks overall.
- Q3** This question on writing down two numbers with a HCF of 8 was answered well with a lot of candidates achieving full marks. Candidates were awarded one mark if they had two numbers with 8 as a common factor, but not the highest. A small number of candidates misread the question and wrote down factors of 8.

This question on finding the values of missing powers for a product of prime numbers was answered very well with the majority of candidates obtaining full marks. Most candidates were using the FACT button on their calculator and writing answers only and this method still obtains full marks.

- Q4** This question on forming and solving a linear equation was not answered well in general. Most candidates struggled to form the linear equation and instead tried to set up simultaneous equations. The correct linear equation was required on the answer line for full marks to be awarded but candidates were still able to get three out of the four marks for using appropriate algebra after not starting with the correct linear equation. Other candidates did not use any algebra and although they could get the answer of £1.80 no marks were awarded when there was no algebra used.
- Q5** This question on finding the density of a cuboid was answered extremely well and the majority of candidates obtained full marks. A very small number of candidates calculated the volume incorrectly while others divided incorrectly.
- Q6** In this straightforward Pythagoras' Theorem question the majority of candidates obtained full marks. Marks were lost for forgetting to find the square root and going on to find the perimeter of the triangle. A small minority of candidate just added the two distances given and received no marks.
- Q7** In this question on finding the area of a compound shape involving a rectangle, semicircle and rhombus almost all candidates were able to gain some marks. The majority of candidates could find the area of the rectangle, however, issues arose when dealing with the semicircle – for example forgetting to half the area of a circle or using the diameter instead of the radius. A lot of candidates also struggled to remember how to find the area of a rhombus with a common wrong answer being 0.06 which was found by multiplying the diagonals but forgetting to halve their answer.
- Q8** This reverse percentages and fractions question was not answered well in general. The main issue seems to be dealing with a multistage problem with several pieces of information. This led to candidates not knowing to start with $85\% = 306$ and in most cases, this resulted in zero marks. Most candidates tried to start this question using the 15% and $\frac{1}{3}$ together which also resulted in zero marks. Some candidates started with $75\% = 306$ and this was a penalty of one mark with follow through applied.
- Q9** This algebraic question on an identity caused a lot of problems for candidates with only a minority gaining full marks. Candidates needed to be able to expand the brackets squared correctly to obtain the first mark as well as any follow through marks and too many candidates struggled to expand correctly. The majority of candidates who did expand the brackets correctly did not understand how to continue to find the value of ' a '. A small number of candidates substituted a numerical value for ' n ' and obtained full marks using this method correctly.
- Q10** This question on finding the equation of a parallel line given a set of coordinates was answered very well in general with the majority of candidates obtaining at least half the marks for correctly finding the gradient. Marks were lost after this for finding the equation of the line for the given coordinates rather than a parallel line or finding a perpendicular gradient.
- Q11** The majority of candidates could form the required quadratic equation correctly here. However, most candidates struggled to solve it using a suitable method as they did not rearrange the equation so that it was equal to zero. Candidates used trial and improvement even though it was clearly stated in the question that this will not be accepted. Some candidates missed the part of the question stating n was a negative number.

Q12 This cumulative frequency question was answered well in general in this series.

The vast majority of candidates correctly completed the cumulative frequency table with only a very small number not knowing what to do and leaving the table blank or making a simple numerical error in adding.

The majority of candidates gained full marks plotting the cumulative frequency graph correctly. Some candidates are making the common errors by plotting midpoints or lower bounds with cumulative frequency which gained two of the three marks. A small number of pupils drew a bar chart which gained zero marks and no follow through to Part (c).

Most candidates were able to find the median and number of teachers who travel more than 27 miles from their cumulative frequency graph with some errors in reading the scale on the x-axis. Some candidates forgot to subtract their reading from 80 in Part (ii).

Q13 In this trigonometry question using an angle of depression, the majority of candidates used the incorrect angle as their starting point, which was a similar error in the June 2022 series. These candidates were still able to obtain two out of three marks if they continued correctly. Only the more able candidates obtained full marks in this question by using the correct angle. Candidates who started with using tan could only gain marks if they went on to use Pythagoras' Theorem correctly.

Q14 The vast majority of candidates were able to attempt this question on bounds and gain some marks. Most candidates were able to write down the correct boundaries for the distance given to the nearest metre, but issues arose when dealing with the work done which was rounded to 3 significant figures. Candidates were able to gain three out of four marks if they had one pair of boundaries correct with the other pair attempted and correct divisions applied for maximum and minimum force. Candidates are encouraged to write down the full answer on their calculator for boundaries questions as marks can be lost for incorrect rounding.

Q15 The vast majority of candidates attempted to add the expression and numbers in the Venn Diagram and let them equal to 32. Only the more capable candidates went on to expand the brackets and obtain a quadratic equal to zero, following on to solve it correctly and find $x = 4$. Some candidates stopped here and forgot to substitute this back into the soccer only part of the diagram. Candidates who did not progress after the first mark either made mistakes expanding the brackets or tidying up the quadratic and letting it equal to zero. Candidates who did not use the '32' at the start could not gain any marks.

Q16 In this factorising question, the most common answer was the first line on the mark scheme i.e. $7(9x^2 - 4)$. Only the more able candidates were then able to recognize the difference of two squares was required. Some candidates divided by 7 first but then used the difference of two squares and were awarded two out of three marks.

Q17 The vast majority of candidates were able to make a reasonable attempt at this question by expanding the brackets and getting at least three of the four correct terms. This then allowed for follow through to the final mark for simplifying. The most common error was getting $-7xy$ for the last term instead of $+7xy$.

Q18 Only the more able candidates were able to obtain full marks in this question on finding the equation of a perpendicular line. The main problem was not knowing or being able to rearrange the given equation in the form $y = mx + c$. The majority of candidates tried to start with a gradient of 2 and no follow through marks could be awarded in these cases.

The majority of candidates who started with the correct gradient of $\frac{3}{5}$ went on to obtain full marks, with some candidates making errors in subbing in the given coordinates.

Q19 Questions involving reasoning with circle theorems still cause problems for the vast majority of candidates and especially when the question is open, like this one. Candidates are reminded that only fully correct explanations will receive the marks awarded – for example the full reason for the last angle in this question on the mark scheme is ‘because opposite angles in a cyclic quadrilateral add to 180° ’. The majority of candidates were not able to identify the correct angle using the Alternate Segment Theorem but were still able to gain some marks in a follow through.

Q20 The vast majority of candidates started this question on solving an algebraic fractions equation by correctly finding a common denominator. However, only the most able candidates obtained full marks in this A* question. The vast majority of candidates still make careless errors in algebraic expansion of brackets and when trying to collect like terms. Candidates were awarded follow on marks after starting with the correct method, however, one simple error per line was penalized and candidates were required to obtain at least three of the first five marks to be able to gain any follow on for the last two marks. Mistakes are still being made using the quadratic formula incorrectly even though it is given on the formula sheet.

Q21 In this question on a stratified sample, candidates generally obtained either full marks or no marks, with only a minority obtaining partial marks. The very able candidates were able to find the sample size correctly and use it to obtain the correct answers. This was a good question to differentiate the top candidates from the rest.

Q22 This was a very challenging histogram question in which only a very small minority of candidates gained any marks for finding the median and IQR from the histogram. This proved to be the most challenging question on this paper.

Approximately half of the candidates were able to gain the first two marks for correctly finding the scale for the frequency density with or without working out shown. The higher ability candidates were able to find the correct answer of 46 and again this question differentiated the top candidates from the rest.

Questions (b) & (c) The vast majority of candidates obtained zero marks in both parts. Only a small number of candidates obtained full marks in these parts.

Question 23 This was another A* question on simplifying an algebraic sum and division and one which differentiated the top candidates from the rest. Only a very small minority obtained full marks in this question, however, partial marks were easily gained here. Marks were awarded for correctly adding the fractions in the brackets, for factorising the terms in the divisor, for inverting the divisor and multiplying. This enabled the weaker candidates to make an attempt at this question and gain some marks.

Assessment Unit M5 Foundation Tier Non-Calculator

Unit Overview

This proved to be a fair paper for many candidates at this level. A broad range of topics were covered and many questions offered opportunity for candidates to score some marks as they were broken down into manageable sections. The majority of candidates attempted all questions and blank responses were seen infrequently, proving the paper to be accessible to most. There was no evidence to suggest candidates ran out of time and many questions allowed for differentiation by ability. The language used throughout the paper seemed appropriate and there were no issues noted in terms of readability. It seemed that fewer candidates in this series did not have access to the required equipment, as the majority of responses in Question 13 demonstrated use of a ruler and protractor to complete the drawing of a trapezium.

Disappointingly, the first two questions examining grade G estimation and fractions, decimals and percentages material respectively were poorly answered by a significant part of the cohort, once again highlighting the fact that basic mathematical knowledge is often lacking at this level. On a more positive note, the majority of candidates showed their methods clearly and part marks could often be awarded if candidates failed to reach the required answer fully or correctly.

In common with recent examination series candidate handwriting on some scripts proved difficult to read and it is still clear that many candidates are failing to check their work or rereading questions to make sure they have answered what is required or that their answer is sensible.

- Q1 (a)** This should have been a relatively straightforward 2 mark introduction to the paper with candidates asked to estimate the number of seats in a theatre with 37 rows of 22 seats. Only a minority of correct responses were seen and common incorrect responses included calculating 37×22 and ignoring the instruction to estimate, $40 + 20 = 60$ and $40 \times 20 = 80$
- (b)** This was poorly answered with most candidates losing the 2 available marks for estimating the number of £5.75 tickets that can be bought with £307. Candidates often attempted to divide 307 by 5.75 and made little progress, while others divided 310 by 6 or rounded £5.75 to £5.
- Q2** It was disappointing to see so many poor responses to finding proportions of pocket money saved. Candidates frequently received none of the available 3 marks for finding $\frac{1}{4}$ of £10, 30% of £7 and 0.2 of £12. Candidates scoring marks were most successful finding $\frac{1}{4}$ of £10 but only the strongest candidates could deal with the other two proportions.
- Q3** What should have been a most straightforward question testing ability to retrieve information and read scale appropriately from a given gauge showing speed, temperature and mileage proved to be untrue. Candidates often were unable in Part (a) to write down the temperature shown and frequently seemed to be answering their own question by writing down a speed. Candidates should be encouraged to read questions carefully and check their answers are sensible at this level as marks are being lost carelessly and often needlessly. In Part (b) better candidates were able to record the speed as 54 mph. Common mistakes included 52 coming from a misread of the scale or 87 (or 88), which was the speed shown in km/h on the other scale. Again, better candidates were able to round 123456 to the nearest thousand in Part (c). Common incorrect responses saw candidates round to the nearest 100000 or 10000.

- Q4** All three parts of this question on likelihood were successfully answered by many candidates. Most candidates in Part (a) identified 'blue' as the colour least likely to be landed on. Those who erred often chose 'yellow', the largest sector shown. In Part (b) the majority of candidates identified '2' as the number most likely to be landed on. Part (c), was the best answered part of the question, with a significant majority of the cohort identifying '1' and '2' as equally likely to be landed on.
- Q5** The full range of marks was seen in this question with better candidates achieving at least 3 of the 4 available marks. There was some misunderstanding of how to deal with the additional 60p for each kg over 7 kg for the Postage Direct cost, with many unable to work out that an extra 9 kg had to be paid for. In some cases, candidates who knew what they were doing could not correctly multiply 60 by 9. It was also disappointing to see some arithmetical errors when candidates calculated the Parcels 'r' Us cost by adding £13.95 and £4.75 incorrectly. Only a small minority of the cohort were penalised for incorrect money notation on the answer line.
- Q6** Part (a) was reasonably well answered with many candidates awarded at least one of the two available marks for correctly calculating the population of Wales. A number of candidates made arithmetical errors when adding or subtracting the decimal populations.
- In Part (b) only better candidates had success identifying the place value of the 4 in 55.4 million as 400000. Less able candidates did struggle to show understanding and in some cases answered with England, the 'place'. Common incorrect responses included tenths or hundred thousandths.
- Q7** This was a very poorly answered question with candidates either not knowing the prime numbers between 10 and 20 or not knowing how to structure their answer. Successful candidates usually wrote out 3 lists for the odd, even and prime numbers and identified prime as the least likely. Common errors included identifying 15 as prime or omitting one of the even numbers when listing the evens. Others who correctly identified 6 evens, 5 odds and 4 primes answered with even, the most likely or with a number. This highlights once again the importance of careful reading of questions and the value of rereading the question after answering to ensure answers are sensible.
- Q8**
- (a)** An accessible question in Part (a) that led to a significant majority of the cohort being awarded the available mark for adding one square to the shape so that it had one line of symmetry. Some candidates lost the mark if they shaded more than one square.
 - (b)** Another well answered question with most candidates able to shade one more square so the shape had rotational symmetry of order 2.
 - (c)** The least successful part of this question saw only better candidates able to state the order of rotational symmetry as 6. Some candidates drew and counted lines of symmetry, but few were able to give 6 as their answer.

- Q9 (a)** This was very well answered. Most candidates were able read 17 from the vertical axis of the distance-time graph. A few careless responses of 16 or 18 were seen.

Most candidates gaining the available mark here explained that the horizontal line showed the train was stationary. A small minority provided further elaboration, often mentioning that the train had stopped to allow passengers to embark or disembark.

Disappointingly answered on the whole with few candidates accurately plotting the required point at (0919,30) and drawing the straight line to represent the next part of the journey. This part of the question proved to be a good discriminator of ability. Common incorrect responses saw candidates drawing a line back to the horizontal axis or drawing their line from (0900,17), the time the train arrived in Lisburn. Others who drew the correct line decided to extend the line to the end of the graph, which resulted in the loss of the mark if (0919,30) hadn't been clearly marked.

- (d)** Another good discriminator of ability with only a handful of candidates awarded the available mark for finding the average speed as 52 mph. Some candidates wrote $1\frac{3}{4}$ s in the workspace but didn't know how to progress their answer. Few spotted that they simply needed to multiply 13 by 4. Some candidates attempted to use the 'speed equals distance divided by time' formula but most were unable to process the units correctly.
- (e)** Most candidates seemed unclear in what was expected here when asked for a reason why the graph shows average speed rather than actual speed. A number of candidates answered that the graph just showed distance and time. Only the very strongest candidates realised that the straight line signified a constant speed which isn't feasible as the train has to change speed during the journey, including slowing down on approach to stations or speeding up when departing stations.
- Q10** What should have been an accessible and straightforward question was on the whole answered poorly by the majority of candidates. Only a small number of candidates gained the mark for providing an appropriate inverse calculation, either $18000 \div 200 = 90$ or $18000 \div 90 = 200$. Most simply described how they would calculate 200×90 without a calculator and lost the mark. Several candidates lost the mark carelessly for answering $1800 \div 200 = 90$ or $1800 \div 90 = 200$.
- Q11 (a)** Most candidates were awarded the first mark for correctly completing the table for patterns 2, 3 and 4 but many lost the second mark by failing to recognise they were completing pattern 7 rather than pattern 5.
- (b)** This proved to be a good discriminator of ability with better candidates able to identify pattern 12 as having 38 rectangles and circles. Some candidates continued to draw the sequence and count the rectangles and circles, while others simply added 3 repeatedly until they reached 38.
- Q12** Very poorly answered, with the majority of candidates unable to calculate 5% of 45. This question was another good discriminator of ability with the very best candidates gaining both marks and others allowed 1 mark for appropriate method, usually finding 10% of 45 as 4.5. The most commonly seen approach was to assume 5% meant one fifth and divide 45 by 5 to produce an answer of 9. A number of candidates found 1% as 0.45 but were unable to multiply this by 5 correctly. Others following a correct method often made arithmetical errors and lost the final mark. The most successful approach was to divide 45 by 10 followed by 4.5 divided by 2. Some candidates gained a mark for writing $\frac{5}{100} \times 45$ but were unable to progress further.

- Q13** This proved to be a very accessible question for candidates at this level. It was pleasing to see so many candidates gaining 3 or 4 marks for drawing the trapezium accurately. Independent marks were awarded for each of the constituent components and this ensured nearly all candidates scored marks in this question. A small number of candidates left the question blank, presumably because they didn't have a ruler or protractor.
- Q14 (a)** Better candidates gained both marks for producing the correct simplified ratio of 3:2. However, many candidates failed to find 40%, the number of entrants failing the test, and worked with 60:100, gaining no marks. Others lost the final mark for not reaching the simplified 3:2, often leaving their ratio as 6:4. A very small number of candidates failed to use the ratio symbol and provided answers such as $\frac{3}{2}$ or $3|2$. Some candidates clearly failed to read the question carefully and answered 40%.
- (b)** Many candidates at this level seem unaware of the connection between ratio and fractions. Only better candidates were able to produce the fraction $\frac{5}{8}$ from the given ratio 3:5. Common incorrect responses included $\frac{3}{5}$ and $\frac{5}{3}$.
- Q15** A very poorly answered question on subtracting fractions with which only the very strongest candidates were successful. For candidates who knew to subtract $\frac{1}{6}$ from $\frac{3}{4}$ the majority failed to find a common denominator and made no progress. It was clear that a number of candidates misinterpreted the question and summed the fractions, in some cases correctly to $1\frac{1}{2}$. A minority of candidates failed to attempt this question leaving the workspace and answer line blank. A number of candidates attempted to multiply the fractions while others tried to convert the fractions to decimals but without success.
- Q16 (a)** This question on translating a trapezium was reasonably well answered, with over one third of the cohort gaining the mark. For those who erred, generally poor counting led to the incorrect position of the image. A small number of candidates produced images which were not congruent to shape A and simple checking would have made this apparent.
- (b)** Many candidates correctly rotated shape A 90° anticlockwise about the origin and gained 2 marks. For those failing to produce the correct image many gained one mark for rotating correctly about the wrong centre or for rotating 90° clockwise about the origin. A small number of candidates failed to produce a congruent shape, which is careless and avoidable through a simple check.
- Q17** Poorly answered, although a minority of candidates picked up one mark for finding 1080° , three times the sum of the angles of a quadrilateral. Few candidates, if any, made use of the diagrams given and many simply answered with 12, from 3 times 4. This question proved to be a good discriminator of ability and only the very best candidates found the correct answer of 8, the number of sides of a polygon with three times the angle sum of a quadrilateral.

Assessment Unit M5 Foundation Tier Calculator

Unit Overview

This proved to be quite a challenging paper for many candidates at this level. The paper had plenty of questions that allowed for differentiation by ability. There was no evidence that candidates had insufficient time to complete the paper and the language used throughout was appropriate.

Fewer candidates than in previous series had no access to a calculator which was pleasing. However, a minority of candidates' handwriting was very difficult to read and this continues the trend from recent series.

It is clear that many candidates are failing to check their work or rereading questions to make sure they have answered what is required or that their answer is sensible in relation to the context given in the question.

Many candidates are now showing their working out, particularly on questions where they made use of their calculator. Part marks were awarded for correct method shown throughout the paper where more than 1 mark was available for a question or question part.

The majority of candidates worked their way through the whole paper and only a small number of candidates gave up when the questions started to become more challenging.

Q1 (a) A disappointing start to the paper as the majority of the cohort failed to understand what they were being asked. Seventeen packs of tiles costing £18.95 are estimated by Andy to cost $20 \times 20 = £400$, but few candidates responded with an appropriate reason why this is an overestimate. Common unaccepted answers included, 'because the actual cost is £322.15' and 'because he rounds up the cost' with no mention of the packs of tiles.

(b) This was another question that was poorly answered despite being at the start of the paper. Mary's electricity bill, 420 units at 12p per unit, has been wrongly estimated as $400 \times 12 = £4800$. Only a small number of candidates identified the mistake as using £12 per unit of electricity, rather than 12p. Others correctly stated that the bill should be £48. Most candidates responded with 'Mary didn't round 12 to 10' or 'Mary multiplied by 400 and forgot about the other 20'.

(c) Only the very strongest candidates understood that rounding £4575, the cost of 75 chairs, to 4800 made the calculation $4800 \div 80 = 60$, divisible by 80. Common answers which gained no marks included 'he rounded to make the calculation easier' or 'so he can order more chairs if he needs to'.

Q2 (a) Just under half the cohort were able to write down the next triangular number as 15.

(b) Few candidates were able to identify 36 as the next number that is both square and triangular.

Q3 It was pleasing to see most candidates gaining some, if not all, of the marks available in this question testing describing likelihood in words. Most of the cohort stated it was certain that there is snow on the highest mountain on the coldest day in Part (a). In Part (b) the majority of candidates described the likelihood of seeing a rainbow car on the way home as unlikely. Part (c), the chance of rain in NI in the first week in March, was identified as most likely, although a small proportion of the cohort incorrectly responded with certain. Most candidates answered evens correctly in Part (d) for the likelihood of getting an odd number when throwing a dice.

- Q4 (a)** Most candidates had no issue reading the level of liquid as 78ml using the straightforward scale.
- (b)** Again most candidates successfully answered with a level of 350 ml.
- (c)** The most challenging part of this question saw fewer candidates awarded the available mark for 335 ml. The scale, going up in 5s from 300 to 350, was misunderstood by over one third of the cohort.
- Q5 (a)** Just over 40% of candidates correctly listed the 9 possible two-digit numbers, with quite a few candidates carelessly losing a mark for listing the same number twice and therefore omitting one of the combinations. This could easily have been avoided through checking. A small minority of candidates misunderstood what was being asked and listed two-digit numbers made from Set A only, then from Set B only. Some candidates ignored the direction to list two-digit numbers and answered with single-digit numbers, which gained no marks and there was no follow into Part (b)(i) and Part (b)(ii) with single-digit answers.
- (b) (i)** Roughly one quarter of candidates gained a mark here for correctly answering 0, or equivalent, as the probability of the two-digit number being even. Follow through marks were allowed for correct probabilities given from incorrect two-digit numbers in part (a).
- (ii)** This was the least successfully answered part of Q5 with only 18% of candidates correctly answering $\frac{2}{9}$ for the probability of the two-digit number being a multiple of 3. It was clear that some candidates were confused by what this meant or how to identify the multiples of 3. Common incorrect responses included $\frac{2}{9}$ and $\frac{1}{9}$.
- A number of candidates were awarded a mark for correct follow of their incorrect answer to Part (a).
- Q6 (a)** The majority of candidates were unable to recall that 1 kg = 2.2 lbs. Common incorrect responses included 1 kg being equal to 10 or 100 pounds.
- (b)** As there was no follow through from Part (a) of an incorrect conversion only those working with 2.2 were able to access the available marks. Most candidates using 2.2 gained 2 marks for showing that the 12 kg case weighed more than 23 lbs and answering 'no'. A small number of candidates who divided 23 by 2.2 to get 10.45 kg lost sight of what they were doing and answered 'yes'. Again, checking of work would probably have saved the needless loss of a mark when candidates realised that the case weighed 12 kg and the carry-on limit was 10.45 kg.
- Q7 (a)** A small majority of candidates correctly read €84 from the conversion graph as equivalent to £70. Most incorrect responses were within €1 but no credit was allowed as there was only one mark available.
- (b)** This was a reasonably well answered question by better candidates who gained both available marks for correctly converting €420 into pounds. Lots of acceptable approaches were seen with candidates taking a variety of readings from the graph. Marks were lost for inaccurate readings and there was no follow if candidates used €100 = £90, taken from the axes limits. Some arithmetical errors in methods were penalised and several candidates attempted to continue the graph beyond the axes limits. A minority of candidates were unsure of how to structure their approach to this problem, while others gave answers greater than 420, clearly demonstrating lack of understanding of the conversion graph they were working with.

- Q8** On the whole this question was completed well by many, with the majority of the cohort gaining at least 1 of the 3 available marks for finding Table Dressing cheaper by 35p for 100 napkins. Some errors were seen in the interpretation of 13.6, with a number of candidates treating it as £13.06. Arithmetical errors were seen in a number of scripts, particularly where candidates worked out $£2.65 \times 5$ and $£3.40 \times 4$ without their calculator. Candidates who chose to work out the price of one napkin for each of the companies, then scale up to the price for 100 napkins were mostly unsuccessful, either through rounding too early or losing sight of what they were working towards.
- Q9** A straightforward question on probability where candidates had to identify the number of girls with blue eyes from a table and express this as a probability of the total boys and girls in the table. Many candidates scored at least 1 of the 2 available marks but it was disappointing to see incorrect totals of 39 and 41, rather than 40 at this level. Common mistakes included $\frac{7}{20}$, the 20 coming from the total number of girls in the group or $\frac{7}{33}$, the 33 presumably coming from candidates subtracting the 7 girls with blue eyes from the 40 children in the group. A small minority of candidates are still answering with words such as 'likely' and not considering fractions in their response.
- Q10** A challenging question with which only better candidates coped well. A large number of candidates are not confident or competent when changing currency, and often multiply when they should divide or vice versa, suggesting that they have guessed and guessed wrongly. The strongest candidates were awarded 4 marks, and it was pleasing to note that the majority of the cohort were able to access at least one of the marks for showing some appropriate method. Most candidates gained the mark for totalling Ulster's ticket prices to £72.95 and a significant number gained a further mark for totalling Clermont's ticket prices to €82. Candidates often erred when converting one of their currencies, with many interpreting the exchange rate as $£1 = €0.83$, rather than $€1 = £0.83$. Some poor arithmetic was seen on a number of scripts and it is clear that candidates are not checking their work in many cases. Some candidates failed to spot that they had worked with €32 rather than €32.50, while others multiplied or divided by 0.85 rather than 0.83. Candidates at this level should be aware of the effects of early rounding within questions and the inappropriateness of truncating the answers given on their calculators. Some candidates lost the final mark for not stating units with their answer. A sizeable number of candidates failed to compare like with like and took £72.95 away from €82. Some misreads were seen, including working with 1 adult and 1 child, 2 adults and 2 children or 1 adult and 2 children, and marks were allowed for appropriate method.
- Q11 (a)** Straightforward question on compass directions answered correctly with east by the majority of the cohort, though it was surprising to see some candidates answering with arrows. Common incorrect responses included left, right and west.
- (b)** Another well-answered question on compass directions although fewer candidates than in Part (a), were able to find the opposite direction to North East correctly as South West.
- Q12 (a)** A very accessible question where many candidates gained 2 marks for completing the table correctly. A minority of candidates were unable to complete the table accurately, possibly due to not reading the instruction given that the number the spinner lands on is added to the number on the dice.

- (b) About one quarter of candidates correctly answered with $\frac{3}{18}$ or equivalent for the probability of a total score of 4. It was pleasing to see few answers given as ratios, though weaker candidates on occasion are still using words such as 'unlikely', rather than answering with fractions. A common mistake was to include the table heading dice outcome '4' when counting the number of 4s in the table, resulting in $\frac{4}{18}$ being answered, which of course lost the available mark. Other incorrect responses included $\frac{4}{24}$ or $\frac{4}{27}$, from adding on the six dice outcomes headings and the three spinner outcomes headings. A small number of candidates answered using decimals and if they answered 0.16 they lost the mark. An incorrect complete table was followed from part (a).
- (c) Better candidates generally were correct when finding the probability of a total greater than or equal to 5. Careless counting cost some candidates the mark, while a small minority of candidates failed to show understanding of the emboldened 'greater than or equal to' information. Again, words such as 'likely' were used, rather than fractions and a small number of candidates answered using decimals. An incorrect complete table was followed from Part (a).
- Q13 (a)** This question proved to be a good discriminator of ability, with only better candidates able to scale the recipe for 16 tray bakes up to 20 and earn the available mark. It was surprising, however, that some candidates who failed to find the correct answer here were successful in Part (b), often earning 3 marks.
- (b) Weaker candidates were mostly at a loss completing the amounts required for the other ingredients and often just added 50g or even 250g on to each of the previously given amounts. Those who were successful often worked with $\frac{1}{4}$, coming from 200g increased to 250g as an increase of $\frac{1}{4}$. A few mistakes were made when calculating the brown sugar's amount as $150 \div 4 = 37.5$, which was sometimes rounded to 38 or truncated to 37, leading to answers of 187 or 188, rather than 187.5g. For candidates who divided 150g by 16 to find each tray bake required 9.375g of brown sugar they ended up with answers including 186 or 187.4g, if they truncated 9.375, or 188 or 187.6g if they rounded to 1 or 2 decimal places.
- Q14 (a)** This straightforward question testing knowledge of probabilities summing to 1 was well answered by only about one third of candidates. Weaker candidates struggled to add the given probabilities and a common incorrect total of 0.21 was frequently answered for the sum of 0.4, 0.15 and 0.2, leading to an answer of 0.79. A follow through mark was allowed for correctly taking a wrong total from 1.
- (b) A minority of candidates successfully found 8 for the expected number of times Susan would buy a drink on her cinema visits, by multiplying 0.4 by 20. A handful of candidates answered $\frac{8}{20}$ or 8 out of 20 and were penalised 1 of the 2 available marks. Weaker candidates were often unable to make any progress with this question. A common incorrect method seen was $20 \div 0.4$, which sometimes led to an answer of 8.

- Q15** This ratio question produced few correct responses and proved to be a good discriminator by ability. Three litres of orange juice is to be made in the ratio 1:11, orange juice to water respectively. Many candidates failed to change 3 litres into millilitres correctly and worked with 300 ml. This led to answers of 25 and 275 ml. Others failed to convert 3 litres and ended up with answers of 0.25 and 2.75 ml. Some candidates worked with $\frac{1}{2}$ of 1000 ml as 83.3 ml, leading to answers of 249.9 ml and 2750.1 ml, rather than 250 and 2750 ml. A small number of candidates lost a mark for writing their answers in the wrong order. However, the most common approach was to use an incorrect method and divide by 11 rather than 12 and end up with an answer of 272.7 and 2727.3 ml or 0.27 and 0.73 ml. It was evident that many candidates sitting this paper are unfamiliar with how to solve this type of ratio problem.
- Q16** Only a small number of candidates were awarded either of the 2 available marks. Two fair coins are tossed and three players need different outcomes to win. Candidates were asked if the game was fair and to calculate who was most likely to win, clearly intimating that the game was not fair. For the first mark to be awarded candidates had either to list the four possible outcomes (HH, HT, TH and TT) or calculate each person's chance of winning (Adam $\frac{1}{4}$, Bob $\frac{1}{2}$ and Carol $\frac{1}{4}$). If the first mark was awarded, candidates earned the second mark for identifying Bob as most likely to win the game. Most candidates failed to list the outcomes or calculate the probabilities, instead giving explanations that were too general and often incorrect or ambiguous. An assumption frequently made was that Bob won with at least one head shown rather than exactly one head. Although many candidates knew Bob had the highest chance of winning few could explain why. On a positive note the question was attempted by nearly all candidates.

Assessment Unit M6 Foundation Tier Non-Calculator

Unit Overview

This proved to be a fair paper for many candidates at this level. A broad range of topics across different levels were covered and many questions offered opportunity for candidates to score some marks as they were broken down into manageable sections. The majority of candidates attempted all questions and blank responses were seen infrequently, proving the paper to be accessible to most. There was no evidence to suggest candidates ran out of time and many questions, particularly towards the end of the paper, allowed for differentiation by ability. The language used throughout the paper seemed appropriate and there were no issues noted in terms of readability.

Disappointingly, the first few questions at the start of the paper were poorly answered by a number of candidates, who struggled to work with decimals accurately, show understanding of place value or prime numbers or understand what was being asked in some cases. On a more positive note the majority of candidates showed their methods clearly and picked up marks throughout the paper.

In common with recent examination series candidate handwriting on some scripts proved difficult to read and it is still clear that many candidates are failing to check their work or rereading questions to make sure they have answered what is required or that their answer is sensible.

- Q1** The full range of marks was seen in this question with many achieving at least 3 of the 4 available marks. There was some misunderstanding of how to deal with the additional 60p for each kg over 7 kg for the Postage Direct cost, with many unable to work out that an extra 9 kg had to be paid for. In some cases, candidates who knew what they were doing could not correctly multiply 60 by 9. It was also disappointing to see some arithmetical errors when candidates calculated the Parcels 'r' Us cost by adding £13.95 and £4.75 incorrectly. Only a small minority of the cohort were penalised for incorrect money notation on the answer line.
- Q2** (a) Generally well answered with many candidates awarded two marks for correctly calculating the population of Wales. A number of candidates made simple arithmetical errors when adding or subtracting the decimal populations.
- (b) Better candidates had no problem identifying the place value of the 4 in 55.4 million as 400000. Less able candidates did struggle to show understanding and in some cases answered with England, the 'place'. Common incorrect responses included tenths or hundred thousandths.
- Q3** This was a poorly answered question with candidates either not knowing the prime numbers between 10 and 20 or not knowing how to structure their answer. Successful candidates mostly wrote out 3 lists for the odd, even and prime numbers and identified prime as the least likely. Common errors included identifying 15 as prime or omitting one of the even numbers when listing the evens. Others who correctly identified 6 evens, 5 odds and 4 primes answered with even, the most likely, or with a number. This highlights once again the importance of careful reading of questions and the value of rereading the question after answering to ensure answers are sensible.
- Q4** (a) An accessible question that led to a significant majority of the cohort being awarded the available mark for adding one square to the shape so that it had one line of symmetry. Some candidates lost the mark if they shaded more than one square.
- (b) Another well answered question with most candidates able to shade one more square so the shape had rotational symmetry of order 2.
- (c) The least successful part of this question saw only better candidates able to state the order of rotational symmetry as 6. Some candidates drew and counted lines of symmetry, but few were able to give 6 as their answer.
- Q5** (a) Very well answered. Most candidates were able to read 17 from the vertical axis of the distance-time graph. A few careless responses of 16 or 18 were seen.
- (b) Most candidates gaining the available mark here explained that the horizontal line showed the train was stationary. A minority provided further elaboration, often mentioning that the train had stopped to allow passengers to embark or disembark.
- (c) Disappointingly answered on the whole with fewer than a quarter of candidates accurately plotting the required point at (0919, 30) and drawing the straight line to represent the next part of the journey. This part of the question proved to be a good discriminator of ability. Common incorrect responses saw candidates drawing a line back to the horizontal axis or drawing their line from (0900, 17), the time the train arrived in Lisburn. Others who drew the correct line decided to extend the line to the end of the graph, which resulted in the loss of the mark if (0919, 30) hadn't been clearly marked.

- (d) Another good discriminator of ability with only the very strongest candidates awarded the available mark for finding the average speed as 52 mph. Lots of candidates wrote $13\frac{1}{15}$ in the workspace but didn't know how to progress their answer. Few spotted that they simply needed to multiply 13 by 4. Some candidates attempted to use the 'speed equals distance divided by time' formula but most were unable to process the units correctly.
- (e) Most candidates seemed unclear in what was expected here, when asked for a reason why the graph shows average speed rather than actual speed. A number of candidates answered that the graph just showed distance and time. Better candidates did realise that the straight line signified a constant speed which isn't feasible as the train has to change speed during the journey, including slowing down on approach to stations or speeding up when departing stations.
- Q6** What should have been an accessible and straightforward question was on the whole answered poorly by most of the cohort. Only a minority of candidates gained the mark for providing an appropriate inverse calculation, either $18000 \div 200 = 90$ or $18000 \div 90 = 200$. Most simply described how they would calculate 200×90 without a calculator and lost the mark. Others lost the mark carelessly for answering $1800 \div 200 = 90$ or $1800 \div 90 = 200$.
- Q7** (a) Most candidates were awarded the first mark for correctly completing the table for patterns 2, 3 and 4 but many lost the second mark by failing to recognise they were completing pattern 7 rather than pattern 5.
- (b) This proved to be quite a successful question with a small majority of candidates able to identify pattern 12 as having 38 rectangles and circles. Some candidates continued to draw the sequence and count the rectangles and circles, but most were able to simply add 3 repeatedly until they reached 38.
- Q8** Poorly answered, with the majority of candidates unable to calculate 5% of 45. This question was another good discriminator of ability with better candidates gaining both marks and others allowed 1 mark for appropriate method, usually finding 10% of 45 as 4.5. The most commonly seen approach was to assume 5% meant one fifth and divide 45 by 5 to produce an answer of 9. A number of candidates found 1% as 0.45 but were unable to multiply this by 5 correctly. Others following a correct method often made arithmetical errors and lost the final mark. The most successful approach was to divide 45 by 10 followed by 4.5 divided by 2. Some candidates gained a mark for writing $\frac{5}{100} \times 45$ but were unable to progress further.
- Q9** It was pleasing to see so many candidates gaining 3 or 4 marks for drawing the trapezium accurately. Independent marks were awarded for each of the constituent components and this ensured nearly all candidates scored marks in this question. A small number of candidates left the question blank, presumably because they didn't have a ruler or protractor.
- Q10** (a) Better candidates gained both marks for producing the correct simplified ratio of 3:2. However, a number of candidates failed to find 40%, the number of entrants failing the test, and worked with 60:100, gaining no marks. Others lost the final mark for not reaching the simplified 3:2, often leaving their ratio as 6:4. A very small number of candidates failed to use the ratio symbol and provided answers such as $\frac{3}{2}$ or $3|2$. Some candidates clearly failed to read the question carefully and answered 40%.
- (b) It was disappointing to see that many candidates at this level seem unaware of the connection between ratio and fractions. Only 42% of candidates were able to produce the fraction $\frac{3}{5}$ from the given ratio 3:5. A common incorrect response was $\frac{3}{5}$.

- Q11** A very poorly answered question on subtracting fractions. Only the strongest candidates were awarded marks. For candidates who knew to subtract $\frac{1}{6}$ from $\frac{3}{4}$ the majority failed to find a common denominator and made no progress. It was clear that a number of candidates misinterpreted the question and summed the fractions, in some cases correctly to $1\frac{1}{2}$. A minority of candidates failed to attempt this question leaving the workspace and answer line blank. A number of candidates attempted to multiply the fractions while others tried to convert the fractions to decimals but without success.
- Q12 (a)** This question on translating a trapezium was very well answered, with the majority of the cohort gaining the mark. For those who erred, generally poor counting led to the incorrect position of the image. A small number of candidates produced images which were not congruent to shape A and simple checking would have made this apparent.
- (b)** Most candidates correctly rotated shape A 90° anticlockwise about the origin and gained 2 marks. For those failing to produce the correct image, many gained one mark for rotating correctly about the wrong centre or for rotating 90° clockwise about the origin. A small number of candidates failed to produce a congruent shape, which at this level is careless.
- Q13** Poorly answered, although a minority of candidates picked up one mark for finding 1080° , three times the sum of the angles of a quadrilateral. Few candidates made use of the diagrams given and most simply answered with 12, from 3 times 4. This question proved to be a good discriminator of ability and only the very best candidates found the correct answer of 8, the number of sides of a polygon with three times the angle sum of a quadrilateral.
- Q14 (a)** Most candidates realised the perimeter of the enlarged shape would be 32 cm, the original perimeter of 16 cm multiplied by the scale factor 2.
- (b)** This question was very poorly answered with only a small minority of candidates knowing they had to square the scale factor to find how many times larger the new area would be. Perhaps candidates are more familiar seeing this type of question presented with a diagram and as a result failed to draw on the knowledge they have been taught in the classroom. The most common incorrect response was 2.
- Q15 (a)** This question proved quite challenging for candidates at this level and was another good discriminator of ability. Better candidates were able to find both missing values and complete the table for 2 marks. Others found one of the missing values correctly and gained 1 mark. Candidates were slightly more successful substituting -3 for x into $y = x^2 + 3x - 3$ than they were substituting $x = 2$. A minority of candidates were unable to find either value correctly.
- (b)** The standard of graph plotting was extremely poor. Careless plotting of points and misplots were frequently seen. It is clear that many candidates are unaware of the symmetry properties of quadratic curves and many need practice drawing smooth curves. Common errors, aside from poor plots include points joined with straight lines and no 'dip' between the curve's lowest points. A number of candidates did not attempt this question.
- Q16 (a)** This straightforward question, changing 15 into a binary number, saw the majority of the cohort gain the mark for 1111. Some candidates answered with spurious leading zeros but were not penalised.

(b) Less well done than Part (a), but still the mark was awarded to roughly half of the candidates for changing the binary number 1000000 into the decimal number 64. A common incorrect response was 128. Many candidates were confused by the instruction to answer with a decimal number and answers such as 64.000 and 64.0 were frequently seen.

Q17 This proved to be another poorly answered question on polygons. Some candidates were awarded a mark for finding 40° , the exterior angle, but most didn't know how to use it to find the number of sides of the polygon. Better candidates found the required answer of 9 and this question proved to be another good discriminator by ability.

Q18 This should have been a very accessible question with 3 marks available for constructing two arcs and shading the appropriate region. The very best candidates did gain 2 or 3 marks but most of the cohort were given no marks. Disappointingly, only a tiny minority produced compass drawn arcs, indicating that loci is a topic teachers need to spend more time in the classroom teaching students at this level. Common incorrect responses saw candidates drawing straight lines, shading hand drawn patches in roughly the right location or drawing arcs outside of tolerance.

Assessment Unit M6 Foundation Tier Calculator

Unit Overview

This was a fair paper for candidates at this level with many questions allowing for differentiation by ability. There was no evidence that candidates had insufficient time to complete the paper and the language used throughout was appropriate.

A minority of candidates' handwriting was very difficult to read and this continues the trend from recent series.

It is clear that many candidates are failing to check their work or rereading questions to make sure they have answered what is required or that their answer is sensible in relation to the context given in the question.

Many candidates are showing their working out, particularly on questions where they use their calculator. It is pleasing to note that fewer candidates are now answering probability questions using ratios. Part marks were awarded throughout the paper for correct method shown where more than one mark was available for a question or question part.

The majority of candidates worked their way through the whole paper and only a small number of candidates gave up when the questions started to become more challenging. In general, the paper was successful in allowing candidates of differing abilities to respond positively to the questions posed.

Q1 (a) Most candidates correctly listed the 9 possible two-digit numbers, though a few candidates carelessly lost a mark if they listed the same number twice and therefore omitted one of the combinations. This could easily have been avoided through checking. A small minority of candidates misunderstood what was being asked and listed two-digit numbers made from Set A only, then from Set B only. Some candidates ignored the direction to list two digit numbers and answered with single digit numbers, which gained no marks and there was no follow into Parts (b) and (c) with single-digit answers.

(b) (i) The majority of candidates gained a mark here for correctly answering 0, or equivalent, as the probability of the two digit number being even. Follow through marks were allowed for correct probabilities given from incorrect two digit numbers in Part (a).

- (ii) This was the least successfully answered part of Question 1. Although many candidates correctly answered $\frac{2}{9}$ for the probability of the two digit number being a multiple of 3 it was clear that some candidates were confused by what this meant or how to identify the multiples of 3. Common incorrect responses included $\frac{2}{9}$ and $\frac{2}{3}$. A number of candidates were awarded a mark for correct follow of their incorrect answer to Part (a).
- Q2** (a) The majority of candidates were unable to recall that 1 kg = 2.2 lbs. Common incorrect responses included 1 kg being equal to 10 or 100 pounds.
- (b) As there was no follow through from Part (a) of an incorrect conversion only those working with 2.2 were able to access the available marks. Most candidates using 2.2 gained 2 marks for showing that the 12 kg case weighed more than 23 lbs and answering 'no'. A small number of candidates who divided 23 by 2.2 to get 10.45 kg lost sight of what they were doing and answered 'yes'. Again, checking of work would have saved the needless loss of a mark when candidates realised the case weighed 12 kg and the carry-on limit was 10.45 kg.
- Q3** (a) The majority of candidates correctly read €84 from the conversion graph as equivalent to £70. Most incorrect responses were within €1 but no credit was allowed as there was only one mark available.
- (b) Roughly 30% of the cohort gained both available marks for correctly converting €420 into pounds. Many acceptable approaches were seen with candidates taking a variety of readings from the graph. Marks were lost for inaccurate readings and there was no follow if candidates used €100 = £90, taken from the axes limits. Some arithmetical errors in methods were penalised and several candidates attempted to continue the graph beyond the axes limits. A minority of candidates were unsure of how to structure their approach to this problem, while others gave answers greater than 420, clearly demonstrating lack of understanding of the conversion graph with which they were working. One candidate was ingenious in their approach and relabelled the axes 0, 100, 200, 300, ... and took their reading directly from their modified graph.
- Q4** On the whole this question was completed well by many, with the majority of the cohort gaining all three marks for finding Table Dressing cheaper by 35p for 100 napkins. Some errors were seen in the interpretation of 13.6, with a number of candidates treating it as £13.06. Arithmetical errors were seen in a number of scripts, particularly where candidates worked out $£2.65 \times 5$ and $£3.40 \times 4$ without their calculator. Candidates who chose to work out the price of one napkin for each of the companies, then scale up to the price for 100 napkins were mostly unsuccessful, either through rounding too early or losing sight of what they were working towards.
- Q5** A straightforward question on probability where candidates had to identify the number of girls with blue eyes from a table and express this as a probability of the total boys and girls in the table. A significant majority of candidates scored at least 1 of the 2 available marks but it was disappointing to see incorrect totals of 39 and 41, rather than 40 at this level. Common mistakes included $\frac{7}{20}$, the 20 coming from the total number of girls in the group or $\frac{7}{33}$, the 33 presumably coming from candidates subtracting the 7 girls with blue eyes from the 40 children in the group.

- Q6** A challenging question with which better candidates coped well. A large number of candidates are not confident or competent when changing currency, and often multiply when they should divide or vice versa, suggesting that they have guessed and guessed wrongly. The strongest candidates were awarded 4 marks frequently, and it was pleasing to note that the majority of the cohort were able to access at least one of the marks for showing some appropriate method. Most candidates gained the mark for totalling Ulster's ticket prices to £72.95 and a significant number gained a further mark for totalling Clermont's ticket prices to €82. Candidates often erred when converting one of their currencies, with many interpreting the exchange rate as £1 = €0.83, rather than €1 = £0.83. Some poor arithmetic was seen on a number of scripts and it is clear that candidates are not checking their work in many cases. Some candidates failed to spot that they had worked with €32 rather than €32.50, while others multiplied or divided by 0.85 rather than 0.83. Candidates at this level should be aware of the effects of early rounding within questions and the inappropriateness of truncating the answers given on their calculators. Some candidates lost the final mark for not stating units with their answer. A number of candidates failed to compare like with like and took £72.95 away from €82. Some misreads were seen, including working with 1 adult and 1 child, 2 adults and 2 children or 1 adult and 2 children, and marks were allowed for appropriate method.
- Q7** (a) Straightforward question on compass directions answered correctly with east by the majority of the cohort, though it was surprising to see some candidates answering with arrows. Common incorrect responses included left, right and west.
- (b) Another well answered question on compass directions although slightly fewer candidates, than in Part (a), were able to find the opposite direction to North East correctly as South West.
- Q8** (a) A very accessible question where most candidates gained 2 marks for completing the table correctly. A minority of candidates were unable to complete the table accurately, possibly due to not reading the instruction given that the number the spinner lands on is added to the number on the dice.
- (b) Most candidates correctly answered with $\frac{3}{18}$ or equivalent for the probability of a total score of 4. It was pleasing to see few answers given as ratios, though weaker candidates on occasion are still using words such as 'unlikely', rather than answering with fractions. A common mistake was to include the table-heading dice outcome '4' when counting the number of 4s in the table, resulting in $\frac{4}{18}$ being answered, which of course lost the available mark. Other incorrect responses included $\frac{4}{24}$ or $\frac{4}{27}$, from adding on the six dice outcomes headings and the three spinner outcomes headings. A small number of candidates answered using decimals and if they answered 0.16 they lost the mark. An incorrect complete table was followed from Part (a).
- (c) Better candidates generally were correct when finding the probability of a total greater than or equal to 5. Careless counting cost some candidates the mark, while a small minority of candidates failed to show understanding of the emboldened 'greater than or equal to' information. Again, words such as 'likely' were used, rather than fractions and a number of candidates answered using decimals. An incorrect complete table was followed from Part (a).

- Q9 (a)** This straightforward probability question testing knowledge of probabilities summing to 1 was well answered by a significant majority of the cohort with the correct answer of 0.25 usually seen. Weaker candidates struggled to add the given probabilities and a common incorrect total of 0.21 was often seen for the sum of 0.4, 0.15 and 0.2, leading to an answer of 0.79. A follow through mark was allowed for correctly taking a wrong total from 1.
- (b)** Many candidates successfully found 8 for the expected number of times Susan would buy a drink on her cinema visits, by multiplying 0.4 by 20. A minority of candidates answered $\frac{8}{20}$ or 8 out of 20 and were penalised 1 of the 2 available marks. Weaker candidates were often unable to make any progress with this question. A common incorrect method seen was $20 \div 0.4$, which sometimes led to an answer of 8.
- Q10** This was one of the least successfully attempted questions on the paper with only a small number of candidates awarded either of the 2 available marks. Two fair coins are tossed and three players need different outcomes to win. Candidates were asked if the game was fair and to calculate who was most likely to win, clearly intimating that the game was not fair. For the first mark to be awarded candidates had either to list the four possible outcomes (HH, HT, TH and TT) or calculate each person's chance of winning (Adam $\frac{1}{4}$, Bob $\frac{1}{2}$ and Carol $\frac{1}{4}$). If the first mark was awarded, candidates earned the second mark for identifying Bob as most likely to win the game. Most candidates failed to list the outcomes or calculate the probabilities, instead giving explanations that were too general and often incorrect or ambiguous. A common assumption frequently made was that Bob won with at least one head shown rather than exactly one head. Although most candidates knew Bob had the highest chance of winning few could explain why. On a positive note, the question was attempted by nearly all candidates.
- Q11 (a)** This question proved to be a good discriminator of ability, with better candidates able to scale the recipe for 16 tray bakes up to 20 and earn the available mark. It was surprising, however, that some candidates who failed to find the correct answer here were successful in Part (b), often earning 3 marks.
- (b)** Weaker candidates were mostly at a loss completing the amounts required for the other ingredients and often just added 50g or even 250g on to each of the previously given amounts. Those who were successful often worked with $\frac{1}{4}$, coming from 200g increased to 250g as an increase of $\frac{1}{4}$. A few mistakes were made when calculating brown sugar's amount as $150 \div 4 = 37.5$, which was sometimes rounded to 38 or truncated to 37, leading to answers of 187 or 188, rather than 187.5g. For candidates who divided 150g by 16 to find each tray bake required 9.375g of brown sugar they ended up with answers including 186 or 187.4g, if they truncated 9.375, or 188 or 187.6g if they rounded to 1 or 2 decimal places.
- Q12** What should have been a straightforward ratio question produced few correct responses and proved to be a good discriminator by ability. Three litres of orange juice is to be made in the ratio 1:11, orange juice to water respectively. Many candidates failed to change 3 litres into millilitres correctly and worked with 300 ml. This led to answers of 25 and 275 ml. Others failed to convert 3 litres and ended up with answers of 0.25 and 2.75 ml. Some candidates worked with $\frac{1}{2}$ of 1000 ml as 83.3 ml, leading to answers of 249.9 ml and 2750.1 ml, rather than 250 and 2750 ml. A small number of candidates lost a mark for writing their answers in the wrong order. However, the most common approach was to use an incorrect method and divide by 11 rather than 12 and end up with an answer of 272.7 and 2727.3 ml or 0.27 and 0.73 ml.

- Q13 (a)** A very well answered question with most candidates clearly aware of how to apply the multiplication rule of indices. The correct answer, t^{11} , for the simplification of $t^3 \times t^8$ was seen on a significant majority of scripts. A few candidates answered t^{11} and lost the mark, while others multiplied the indices and answered t^{24}
- (b)** This question, simplifying $(t^2)^3$, was less successfully answered than Part (a), although the majority of candidates still produced the correct answer. The most common incorrect answer given was t^5
- Q14 (a)** This part of the trial and improvement question proved inaccessible to most candidates with only a minority able to show that $20x - x^3 = 1$ has a solution between 4 and 5. Candidates have maybe not practised this type of approach and layout to solving trial and improvement problems in class, but their understanding of the topic should have made this a much more straightforward question than it turned out to be. Many candidates correctly showed the solution to Part (a) in Part (b), but retrospective marking was not allowed. Some careless calculating led to answers of 16 and 25, rather than 16 and -25
- (b)** About one quarter of the candidates managed to pick up one or two marks for attempting to find the solution to the equation correct to one decimal place, but only the very strongest candidates were awarded all three marks. A common incorrect answer was 4.5, rather than 4.4, which was seen on many scripts. Some candidates omitted to test 4.45, but still were able to provide 4.4 as their answer. Some inaccurate calculated values were seen and some candidates showed work to 2 decimal places. A minority of candidates either failed to attempt this question or showed no understanding of the topic in their approach.
- Q15** This straightforward change of subject question proved to be a great discriminator of ability with only better candidates accessing the available marks. Most candidates struggled to deal with the u and few were awarded the first mark for producing $v - u = at$. Some candidates mixed up their u and v during their steps, and in general most candidates did not know how to separate the a and t appropriately.
- Q16 (a)** This question on relative frequency proved to be another good discriminator by ability. Better candidates were able to produce the required 0.128 for the missing relative frequency value and some candidates were awarded a mark for answering with $\frac{64}{500}$ or equivalent fraction. The majority of the cohort were unable to show understanding of this topic and a number of blank responses were seen.
- (b)** Better candidates were able to answer with 122 correctly for the number of times the spinner landed on a 3 for the 1000 spins. Common incorrect answers included a large number of 128s and some 244s. Again this question discriminated by ability.
- (c)** Only the very strongest candidates produced 305 for the number of threes expected in 2500 spins. Many blank responses were seen and the most common incorrect response of 308 came from an incorrect method, where candidates used the relative frequency value of 2×122 for 2 lots of 1000 spins and added on the relative frequency value of 64 for 500 spins.

Assessment Unit M7 Higher Tier Non-Calculator

Unit Overview

The non-calculator paper proved accessible for the majority of candidates. All questions were generally well attempted, with no evidence of candidates being short of time to attempt the questions. Working out was usually seen which meant candidates could gain some of the marks that were available, even if the particular question was of a higher grade level than they might be able to achieve.

- Q1** The table was completed well in Part (a). A few errors were seen in the last column. Part (b) was also well answered.
- Q2** Part (a) was very well answered.
 In Part (b) many different reasons were given. Many candidates stated that the train had stopped to allow passengers on and off or another suitable reason for stopping.
 Part (c) Some wrong answers were seen here, although the majority drew the correct line. Some lines were drawn from the point (0900, 17).
 Part (d) Candidates should perhaps work this out by 13×4 rather than using distance divided by time as the difficulty arises with the time of 15 minutes and changing it into a time in hours. Just over a third were able to complete the calculation correctly.
 Part (e) Many incorrect answers here stated that the graph did not show speed or that it was a distance time graph, but slightly more gained the mark here than in the previous part.
- Q3** The calculation to check should have been the inverse calculation. The explanation of how to work out 200×90 did not gain the mark.
- Q4** Many methods were used to calculate 5% of 45 and did gain the method mark. Some had difficulty dividing 4.5 by 2. A few wrong answers of $45 \div 5 = 9$ were seen.
- Q5** Two thirds of the candidates produced very good accurate drawings. Some of the others had difficulty with the angles, but most gained some marks.
- Q6** Part (a) was generally well answered. A small minority of candidates had the ratio correct but did not simplify it fully. A few had the incorrect order.
 Part (b) was also well answered. A few wrong answers of $\frac{3}{5}$ or $\frac{3}{8}$ were seen.
- Q7** Wrong work here, by over half the entry, included attempts to add, multiply and divide the fractions. Some who knew to subtract had difficulty with getting the common denominator and about 40% gained both marks available.
- Q8** Part (a) was well answered.
 Part (b) was generally well answered but some candidates went clockwise, and some used the wrong centre of rotation.
- Q9** Candidates were able to gain the 1 mark by their correct calculation of 1080° . Candidates did not seem to use the diagrams provided to help with their working out.
- Q10** Part (a) was well answered.
 Part (b) seemed to be more difficult with 2 often seen or the area worked out.
- Q11** Candidates generally did not know to work out the exterior angle and then find the answer by dividing 360 by 40. Just over a quarter gained full marks.
- Q12** The arcs were well drawn here with the shading included. A few did not know to use arcs and some were penalised for inaccuracy.

Q13 Part (a) The completion of the table proved difficult for some candidates, especially working with $x = -3$

Part (b) Candidates should take greater care with plotting points. Even a point such as (1, 1) was plotted incorrectly. A smooth curve should be seen. Candidates should be aware of the general shape of the quadratic curve and realise that an error has been made when their curve is not a parabolic shape.

Part (c) was poorly done or left out, except by about one tenth of the candidates.

Q14 Both parts were generally well done.

Q15 A common wrong answer of 100 was seen.

Q16 Many candidates used trial and improvement and did not gain any marks. Those who knew to set up simultaneous equations were able to gain at least 2 or 3 marks.

A common correct approach was to set up $x + y = 860$ and $2x + 0.5y = 820$

Q17 Some confusion with drawing the line $x = -1$

Candidates show remember to use the letter R to indicate the region

Many candidates had difficulty with drawing the line $y = 2x$ in part (b)

Assessment Unit M7 Higher Tier Calculator

Unit Overview

The calculator paper also proved accessible for the majority of candidates. Again all questions were generally well attempted, with no evidence of candidates being short of time to attempt the questions. Method marks were often gained by candidates laying out their work clearly and making some progress with questions which in totality were a little beyond them.

Q1 Many candidates made a good start to the paper with the correct answer seen. Some candidates made an error with the addition of the numbers in the table. Some wrong answers of $\frac{7}{20}$ or $\frac{7}{11}$ were seen. Candidates should not use ratio.

Q2 Many candidates were able to work this out. Over half scored the full four marks. Some made errors with the conversion from pounds to euro or euro to pounds, but gained some method marks in the question.

Q3 Both parts of this question were well answered.

Q4 In Part (a) the table was completed correctly in most cases. Parts (b) and (c) were both well answered.

Q5 In Part (a), the correct answer of 0.25 was usually seen. Some made an error with their addition of the 3 probabilities but did know the method of subtracting this from 1. Candidates are encouraged to show working out as the method seen can gain a mark.

Part (b) was also well answered. Some candidates wrote $\frac{8}{100}$ instead of 8. A few did not know to work out 0.4×20

Q6 Many candidates thought the game was fair as they thought the probability was $\frac{1}{3}$ for each. Correct work was seen on over a quarter of the scripts using the 4 possible outcomes leading to Bob being most likely to win.

Q7 Parts (a) and (b) were generally well answered. Some incorrect work was seen with the addition of 50g each time.

- Q8** Generally, well answered when candidates used 3000ml at the start. Some candidates worked with 1litre or 1000ml and then multiplied by 3
Some wrong work by a large minority of candidates included dividing 300 by 12 or dividing 3000 by 11
- Q9** Laws of indices were generally well known. Part (c) proved difficult for some.
- Q10** Many candidates left Part (a) blank and did not know to substitute in $x = 4$ and $x = 5$
Part (b) was well answered. Candidates sometimes had the correct work but then chose $x = 4.5$ rather than $x = 4.4$ Some candidates still do not work out the $x = 4.45$ value and therefore lost a mark.
- Q11** Many candidates went straight to the correct answer. Candidates are encouraged to show each step.
- Q12** Parts (a) and (b) were better answered than part (c). In Part (c), some candidates did not know to use the relative frequency of 0.122 and were using the value for 500 spins as well.
- Q13** This was generally not well done. Some candidates did get $A=1.2$ for 1 mark.
- Q14** This question was very well answered.
- Q15** In Part (a) many incorrect answers were seen which included rotations and translations.
Part (b) was also generally not well done. Some candidates did not know that the triangle would be smaller. Some did make the triangle half the size but did not use the centre of enlargement given in the question, $(-2, 0)$.
- Q16** Part (a) was very well answered.
In Part (b) some candidates added the 2 fractions rather than multiplying them.

Assessment Unit M8 Higher Tier Non-Calculator

Unit Overview

This paper had enough straightforward questions to allow candidates entered at the most suitable level to demonstrate their knowledge and understanding, while also containing some challenging questions which enabled the stronger candidates to distinguish themselves and prove worthy of the higher grades on offer. It appeared that a minority of the entry might have been better suited to GMC7 than GMC8, but it was encouraging to see a large number of scripts containing answers of a high quality and thus gaining high percentage scores. The language and length of the paper seemed fine and there was no evidence of candidates not being clear about what was being asked, nor of being short of time to attempt all questions.

- Q1** A large majority of the candidates were able to calculate the perimeter of the enlarged shape, but less than half knew that the area involved squaring the scale factor for length.
- Q2** More than half the candidates did not realise that the interior angle should be calculated first, but over 40% gained both marks on what appeared to be a straightforward introductory question on angles in a polygon.
- Q3** This locus question was well answered with well-drawn arcs and correctly shaded regions. It appeared that some candidates did not have a pair of compasses.

- Q4** Most candidates were able to set up a pair of equations, although often disregarding pence and pounds. Only a few attempted to use trial and improvement, with most noting that such a solution would not be accepted in this question. A third of the entry were able to make full sense of their solution to the equations and deduce the correct answer.
- Q5** In Part (a), half the candidates gained both marks, but many drew $y = -1$ instead of $x = -1$ and only a few of these gained one mark for following through correctly from this error in identifying the region on the graph. This was also a common error in part (b), while a few had difficulty in drawing the line $y = 2x$, but nearly half gained both marks in this part also.
- Q6** Most candidates completed the table correctly for the quadratic. The vast majority of these plotted the points correctly but a sizable minority did not join the points with a smooth curve with a clear minimum below the two lowest plotted points. Nearly 40% of the candidates were able to use well-drawn graphs to read two points of intersection with the x axis and about 10% only gave one of these points. About 30% correctly drew the line $y = x + 1$ on the grid and even more were able to state the quadratic equation which had been solved. The highest grade final part of this question was unsurprisingly answered only by the strongest candidates.
- Q7** The conversions between binary and decimal numbers were generally well done at this level.
- Q8** Changing a recurring decimal to fractional form was well done, with occasional numerical errors by stronger candidates and method misunderstanding by the weaker.
- Q9** Nearly all candidates knew the centre of the circle, but less than a fifth could write down the equation of the circle. Many knew the correct form but used r instead of the numerical value 10. Half the candidates found the gradient of the diameter correctly but, while many found the gradient of the (perpendicular) tangent, only a fifth completed all the manipulation to arrive at the equation of this tangent. Again, the final two very testing parts were only understood by the best candidates, as expected.
- Q10** Most recognized the place of Pythagoras in this question on right angled triangles and gained some marks. The question differentiated across the ability range by allowing candidates to demonstrate the extent of their understanding of surds, rational and irrational numbers.
- Q11** The final question on fractional and negative indices also differentiated as intended with the best candidates able to manipulate the indices to decide which number was prime and which a surd.

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The paper was set at a suitable standard for most of the candidates although some very low scoring scripts suggested that those candidates were not yet ready for this level of entry. There were also many high marks gained where candidates were obviously very well prepared for the examination. It was pleasing that many candidates performed very well in the later questions designed to examine the higher grades. Level of language difficulty and time allocated for completion proved satisfactory.

- Q1** The questions on algebraic indices were very well answered with only the third part quite testing for a minority of the candidates.
- Q2** The slightly different introduction to this trial and improvement question tested understanding and was thus answered by only the top half of the entry, but most were able to demonstrate the appropriate method in the conventional second part, although often the wrong final answer was chosen, even despite the midpoint having been checked.
- Q3** Three quarters of the candidates completed the rearrangement of a straightforward formula successfully, while some made simple algebraic errors.
- Q4** A large majority of the candidates showed good understanding of relative frequency, particularly in the first two parts. In the third part, while the majority used the relative frequency from the largest number of trials as the best for prediction, some used a combination of those for 1000 trials twice and 500 trials once to predict the outcome for 2500 trials, demonstrating mistaken creative thinking.
- Q5** This question on standard form required careful interpretation and thus only the stronger candidates were able to score full marks. Surprisingly fewer failed to gain a mark in Part (b) than in the standard Part (a).
- Q6** This question was very well answered.
- Q7** Transformations proved a good differentiator across the ability range. More than half described the reflection correctly, with a small number incorrectly identifying the line of reflection. Slightly less than half drew the challenging enlargement correctly, but some used the wrong scale factor and some the wrong centre of enlargement.
- Q8** Only the best candidates gained both marks in this testing manipulation of negative and fractional algebraic indices, while many gained one mark for sight of 2.5 as one required value on the way to the solution.
- Q9** This proved the most difficult question on the paper, with only the very best gaining the full three marks. Most recognized that a square root was involved but generally took the root of 21 rather than of 1.21 or 121. Some reached 1.1 but did not recognize this as signifying a 10% increase.
- Q10** The probability tree diagram was extremely well completed. Nearly half the candidates ignored one of the three branches needed for the complete solution, but a large minority gained the full six marks for the question.
- Q11** This question on trigonometry was well attempted by the majority of candidates who demonstrated good use of trigonometry in a right angled triangle and then the use of the sin rule in the second triangle. Weaker candidates often successfully completed the first part but worked with the second triangle as if it were also right angled.

- Q12** This question continued the testing of the trigonometry which forms a sizable portion of the specification for GMC8. Good attempts were generally still forthcoming, although a few more struggled with this question. A common error was the use of $\frac{1}{2}bh$ as the formula for the area of a triangle rather than that involving $\sin C$, as listed in the formula sheet. Over a third were successful with using both the area formula and then the Cosine rule to reach the correct answer.
- Q13** Candidates were clearly well prepared for this topic with more than half gaining three marks for the non-replacement probability Part (a) and nearly 40% correctly completing the testing Part (b).

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