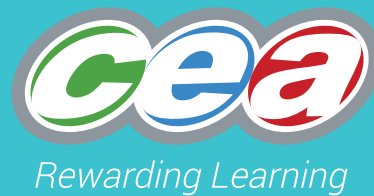


GCSE



# Chief Examiner's Report Mathematics

November Series 2021





## Foreword

This booklet outlines the performance of candidates in all aspects of this specification for the November 2021 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](http://www.ccea.org.uk).



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# GCSE MATHEMATICS

## Chief Examiner's Report

### Subject Overview

With all the disruption experienced over the last two years, this suite of papers seems to have provided an encouraging introduction to formal GCSE examinations for candidates who appeared well prepared across the full specification. The papers proved a good test for most of the candidates who had little experience of public examinations at this level. In general, most candidates seemed to perform well, with the papers being successful in allowing candidates of differing abilities to respond positively to the questions posed. The vast majority of candidates attempted every question. The papers had a moderate incline of difficulty and the standard of answering was in general good, particularly in the non-completion papers. Given the circumstances, it was not surprising that the entry numbers for the completion papers were quite small, but here also it was evident that significant work had been done by teachers and candidates alike.

### Assessment Unit M1 Foundation Tier

#### Unit Overview

This proved to be a very accessible paper for candidates at this level. Marks ranged from single figures to high nineties and 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.

It was evident that some candidates either did not have access to a calculator or were reluctant to use it if they had one, as a lot of needless calculations were attempted manually and not checked. Several candidates did not have access to a ruler, stating so explicitly on their paper, and were unable to attempt one of the early questions. A minority of candidates' handwriting was very difficult to read and this showed a marked deterioration over previous 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.

It was pleasing to see so many candidates showing their working out. Part marks were consistently awarded for correct method shown throughout the paper where more than one mark was available for a question or question part.

- Q1** The majority of candidates found this question on matching numbers in words to the corresponding figures straightforward and most were awarded full marks.
- Q2** Some candidates did not have a ruler and were unable to measure the line given. Many correct answers were seen but a significant minority of candidates recorded an answer of 10cm, either through poor measuring or by rounding their length up to 10. A small number of candidates were confused by the instruction to answer correct to the nearest millimetre and gave answers such as 95, which was only accepted if they crossed out the 'cm' on the answer line and wrote 'mm' along with their answer.
- (b)** A pleasing number of candidates were able to read the time from the analogue clock correctly, though some provided confused notation, such as 1940 pm. There are still however a sizable proportion of the cohort who are unable to read analogue times accurately and common incorrect responses included '20 to 9', '8:38' and 'forty minutes to 8'.

- (c) Most candidates were able to convert 135 minutes correctly into 2 hours 15 minutes. A common incorrect response was 1 hour 35 minutes, where candidates worked with 100 minutes in an hour. Some arithmetical errors were seen with candidates unable to take successive 60s away from 135 accurately.
- Q3** (a) (i) Few candidates were unable to identify USA as using the most water, though several responses indicated a numerical value rather than the country.
- (ii) A very well answered question with most candidates giving UK as the country using 175 litres of water per person.
- (iii) The final part of this question on bar charts was also very well answered with most candidates giving a number within the appropriate range of 335 to 345.
- (b) (i) It was pleasing to see that the majority of candidates had little difficulty identifying plastic bags as the mistake though some of the explanations were a little unconvincing. Some incorrect responses gave the reason as 'the pictogram uses half symbols', which shows a poor understanding of this topic.
- (ii) Many candidates identified that it would not be sensible to add glass to the pictogram as it would take too long to draw the symbols needed or that there would not be enough room. Some candidates referenced the fact that the number of years glass takes to decompose is nowhere near the order of magnitude of the years required for the other objects. A minority of candidates were confused by what was being asked and provided answers referencing glass breaking and being dangerous to add to a pictogram. Others stated that glass takes so long to decompose that Alice wouldn't be alive to check if the statement was true and were not awarded a mark.
- Q4** (a) This question on totalling breakfast items was well answered by the majority of candidates who had little difficulty finding the correct total of £4.05. Some candidates confused their notation and recorded their calculator value as £4.5 while others wrote down £450 or £4.05p. One mark was often awarded to candidates who were able to correctly identify and sum most of the required items.
- (b) The majority of candidates were able to correctly subtract £3.50 from their answer to Part (a). Marks were needlessly lost for poor money notation, the most common examples being 0.55p or 0.55
- Q5** (a) Candidates had little difficulty identifying the cheapest Cell4U plan from the table though some candidates wrote down the price rather than the plan. Those who were mistaken often misread the question and identified the cheapest plan overall.
- (b) Another well answered question with candidates mostly able to identify G as the correct plan. Some candidates lost this mark if they wrote down the network rather than the plan as the network Cell4U has 3 plans. Others were not penalised for writing down the price rather than the plan as the price is unique.
- (c) This part of the question, on identifying the plan suited to using 1 GB of data each day, was the least well answered, though it was pleasing to still see a majority of correct responses. Candidates who wrote down the network lost the mark, as there are 2 plans on the Green network, but those who gave the price of '30' earned the mark.



- Q6** Most candidates were awarded at least one of the three available marks for matching metric units to what they measure. This question proved to be a good discriminator of ability with better candidates matching all 5 units correctly. Marks were lost if candidates put more than one tick in a row.
- Q7** (a) It was pleasing to see so many candidates substituting 17 into the formula, multiplying by 2 and adding 10 to get 44. A small minority of candidates were unclear about the order of precedence and added 10 to 17 before doubling and answering 54. In some cases an answer of 34 was given with the candidate simply forgetting to add the 10 in the formula.
- (b) This question proved to be a good discriminator at this level with more able candidates earning the available mark. Better candidates realised that the '+10' part of the formula meant £10 was paid regardless of the number of cars washed. Others, however, applied the formula with '0' and ended up with £20 or £12. Some responses ignored the information given in the question and answered along the lines of 'no work done, so no pay'.
- Q8** A small minority of candidates achieved the full 3 marks available in this question which tested factors and multiples. It was clear that many candidates at this level are confused by this topic and have only a vague idea of what factors and multiples are, often mixing them up. Generous marking allowed most candidates to pick up at least one of the marks for identifying any correct multiple of 3 or factor of 15.
- Q9** This question on range and mean was either very well answered by better candidates or poorly understood but was attempted by the majority of the cohort.
- (a) A straightforward question on range awarded one mark to candidates who were able to identify 47 and 10 and find the difference of 37 correctly. Many candidates mixed up range with mode, median or mean and had little success through the question's three parts.
- (b) Candidates who knew how to calculate the mean were generally accurate in their working and earned all three available marks. Some arithmetical errors were seen but these responses were mostly awarded two marks. A small number of candidates divided the total by '5' rather than '6' and were penalised. It was disappointing to see a large number of correct answers of 27.5 in the workspace which were then rounded to 27 or 28 on the answer line.
- (c) Better candidates were able to simply take '2' away from their answer to Part (b) and gain the mark. A lot of candidates, however, carried out the full method again, needlessly.
- Q10** (a) Most candidates had little problem ordering the bank balances correctly, but some transcription errors were seen, again highlighting the importance of checking work.
- (b) A sizable proportion of the cohort were able to correctly add 120 onto -190. A common incorrect response was 70.
- (c) This proved to be the most challenging part of the question with only the better candidates finding the correct answer of 800 for the difference between the two bank balances, Bernie's £230 and Jonny's -£570. A common incorrect answer was £340, which was simply  $570 - 230$ .
- Q11** (a) Only better candidates recognised the 'propeller' as having rotational symmetry of order 3, with 'wheel' the most common incorrect response.
- (b) The majority of the cohort correctly identified the 'anchor' as having exactly one line of symmetry.

- (c) It was pleasing to see so many correct responses to the most difficult part of the question. Almost half of the candidates correctly identified the ‘lifebuoy’ and the ‘wheel’ as having both line and rotational symmetry.
- Q12 (a)** This question proved accessible for candidates across the ability range with many fully correct responses seen and a large number of partially correct answers. Some explanations were unconvincing, but in general if two-fifths was converted into 40%, both marks were awarded. Candidates changing the fraction into 0.4 were less successful on the whole, with many stating that 35% is greater than 0.4. Some candidates revisited this question part with their answer to Part (b) and found 35%,  $\frac{2}{5}$  and  $\frac{1}{4}$  of 60, which was a perfectly acceptable method.
- (b) This was a very poorly answered question with a large majority of the cohort unable to produce the required response. Only the very best candidates showed that if 15 candidates equate to  $\frac{1}{4}$  of all the candidates then there must be 60 in total. A common incorrect response, presumably from guessing, was 100.
- Q13** This was a question that the majority of the cohort found accessible, with many correct answers awarded 3 marks. For candidates multiplying £45.50 by 26 correctly, 2 marks were awarded for £1183. Most candidates who earned no marks often employed a wrong method, for example, adding £45.50 to £300 and multiplying this total by 26 or simply adding £300, £45.50 and 26. A small number of candidates misread the information given and worked with days rather than weeks and were penalised 2 marks.
- Q14 (a)** Finding the perimeter for the guttering was well answered by many candidates with 13m a common correct response earning 2 marks. Common incorrect responses included  $4 + 2.5 = 6.5$  or  $4 \times 2.5 = 10$ , finding either half of the perimeter or the area respectively.
- (b) It was pleasing to see many fully correct responses earning all 3 marks and a sizable number of candidates being awarded either 1 or 2 marks for partially correct solutions. The correct answer of 3.85m was sometimes seen in the workspace but an answer of 7.7m was given, presumably the candidates believing they were being asked to find the total of the two ‘widths’ of the shed. Weaker candidates were unable to progress from 13.8 (subtracting the length given from the total given) or 12.2 (doubling the length given) and earned no marks.
- Q15 (a)** It was disappointing to see relatively few correct answers to a simple area question. It is clear that many in the cohort were unable to identify the two sides needed to produce the area of the front face of the cuboid. The most common incorrect response was 10, from  $5 \times 2$ , which used the correct length and an incorrect height.
- (b) Finding the volume of the cube by multiplying all three given lengths together proved to be much more successful with many correct answers of 30 seen. A common incorrect answer was  $5 + 3 + 2 = 10$ . Candidates’ answers to Part (a) were followed through for both marks for correct doubling of their answer.
- Q16** Quite a lot of candidates gained full marks on this question relating to a £200 budget. It was pleasing to see much good method shown and a variety of appropriate approaches either led to completely correct or partially correct solutions. Candidates who found the cost of 3 tins of paint and subtracted this from £200 before going on to divide by £12.30 often fared better than those who attempted to add on £12.30 repeatedly to the cost of the paint until they got to a cost approaching £200. Some candidates got as far as  $\frac{149.75}{12.30} = 12.17 \dots$  and either answered 12.17 or rounded up to 13 rather than down to 12, losing the final mark. A minority of candidates worked

with either 1 or 2 tins of paint, rather than 3, but were still able to access 2 of the available 3 marks on follow through. A small number of candidates followed incorrect methods and gained no marks.

- Q17 (a)** It was clear that the majority of candidates at this level cannot work with 3-letter angle notation. Many calculated the correct answer of  $26^\circ$  but wrote  $180^\circ$  on the answer line, presumably treating angle ACB as the sum of the angles at A, B and C. Others wrote  $64^\circ$ ,  $90^\circ$ ,  $26^\circ$  on the answer line following similar logic. Most candidates producing  $26^\circ$  marked this angle in the correct position on the diagram.
- (b)** This question proved to be a good discriminator of ability with only the very best candidates earning all three marks. Most of the cohort failed to gain any marks but a minority were allowed 1 mark for correctly taking their answer to Part (a) away from  $180^\circ$ . They were then mostly unable to gain the second mark for taking this answer away from  $180^\circ$  and dividing by 2. A common incorrect response was  $77^\circ$ , coming from  $180 - 26 = 154$ ;  $\frac{154}{2} = 77^\circ$  which gained 1 mark only.
- Q18** It was nice to see many correct answers to this problem involving decimals. Candidates generally showed plenty of working out and even if there were arithmetical errors, they still picked up some of the 4 available marks for their correct methods. Some candidates misread the information given and mixed up the 11m of guttering and 7m of downpipe but in many cases could still be awarded up to 3 marks. Some less able candidates scored no marks for serious errors at the start of the question which were not followed.
- Q19 (a)** Many correctly drawn side elevations, particularly from stronger candidates were seen. One mark was awarded for partially correct solutions to a large proportion of the cohort. A minority of candidates were unprepared in this topic and drew nets, 3D representations of the solid or 'elevations' that were disjointed. The most common incorrect elevations were missing the top square and a small minority of candidates produced the mirror image of the required elevation or a rotated version of it.
- (b)** This proved to be one of the least well answered questions on the paper with only a very small number of candidates able to work out how many cubes would be required to make the solid into a cube. A common incorrect response was 7 which would complete 3 layers of the solid shown.
- Q20** Better candidates only were able to answer this Venn diagram question fully correct. Many candidates did however gain at least 1 mark for placing '3' outside the circles, with some gaining a further mark for the '4' in the overlap.
- Q21** This was another question that proved to be a good discriminator of ability. Better candidates were quickly able to identify 1 worker as  $9^\circ$  (from  $\frac{360}{40}$ ) and complete the table relatively easily. Some candidates were awarded 1 mark, often fortuitously, for placing the '5' or '12' in the correct box in the table. It is clear that some candidates sitting this paper were expecting to have to draw a pie chart as pie charts were constructed in the workspace on a number of scripts.
- Q22** This was another good discriminator of ability where only a very small number of candidates gained all 5 marks. Some of the better candidates were awarded 4 marks for being able to deal with the rectangular and circular areas correctly and appropriately but failed to provide the correct unit with their answer. A sizable proportion of the cohort were awarded 1 mark for finding the area of the plot as 616 while several candidates were allowed 1 mark for including the correct unit,  $m^2$ , with their incorrect answer. The vast majority of candidates were unable to deal with the circular landing pad and most of those who knew to apply the formula  $A = \pi r^2$  were unable to progress from  $64\pi$  (or more often than not  $\pi 8^2$ ).

- Q23** Candidates sitting this paper are generally unprepared for non-functional algebra questions and the vast majority of the cohort were unable to gain a mark in either part of the question.
- (a) A small minority of candidates were able to correctly multiply out the bracket. Most candidates have no understanding of what is required to answer this question.
  - (b) Again, few correct responses were seen. The most common response to this question on factorising was  $39w$ , showing no appreciation of this topic.
- Q24** This 3 part question was another great discriminator of ability and some of the strongest candidates gained most, if not all, of the 7 available marks.
- (a) Many candidates gained all 3 marks for correctly finding 15% of £75 and subtracting it correctly from 75 to give the sale price of £63.75. Two marks were rarely awarded and mostly in the case of an arithmetical error being penalised and followed through. However, a large number of candidates were allowed 1 mark for correctly finding 15% of £75 as £11.25 and progressing no further. Common incorrect responses included £60 (treating 15% as £15) and £74.85 (removing 15p from £75).
  - (b) Candidates who failed to gain all 3 marks in Part (a) rarely gained marks in this part of the question. Better candidates were able to remove a further 20% from their Part (a) answer to show the required £51. The majority however followed wrong methods and were awarded no marks. A very common incorrect response was £10.20 (20% of £51).
  - (c) Only the strongest candidates were able to show sufficient working, as instructed, to demonstrate that 15% off £75 followed by 20% off this reduced price is not the same as 35% off the original £75. A few candidates earned 1 mark for showing a clear and unambiguous understanding of why Rhys' statement is incorrect without calculations. Most candidates however simply agreed with Rhys, asserting that  $15\% + 20\% = 35\%$ .
- Q25**
- (a) Roughly half the candidates realised that the data needed to be ordered and answered appropriately. Others ordered the data and found the correct median of 0.52, but failed to explicitly state anywhere that the original data was not in order, so did not gain the mark. A number of candidates confused the median with the mode, range or mean.
  - (b) Many candidates, which was pleasing for a question near the end of the paper, produced accurate stem and leaf diagrams and were awarded 2 marks. A significant number of candidates were awarded 1 mark for producing unordered diagrams or for a mistake in their diagram. A minority of candidates did not attempt to complete the diagram, presumably because they were unsure of what was expected.
  - (c) One mark was awarded, generously, for a range of answers which were deemed acceptable. These answers ranged from the expected, 'the data is now in order' to 'makes it easier to find the median/range', 'helps with your working out' or 'it's easier to understand'.
  - (d) Better candidates were awarded this mark which was only allowed if following an ordered stem and leaf diagram in Part (b).

- Q26** This question proved to be a good discriminator of ability. Better candidates had little difficulty gaining at least 2 of the 3 available marks, with some not taking their fraction away from 1 to produce  $\frac{1}{5}$ . A variety of approaches were shown, the most successful being the alternative solution shown in the mark scheme (calculating 160, 100 and 60, summing to 320, taking away from 400 to get 80, leading to  $\frac{80}{400}$ ). Some candidates converted the fractions into percentages and summed them to 80%, leading to 20% and the correct answer of  $\frac{1}{5}$ . A significant number of candidates lost sight of what they were asked to do and left their answer as  $\frac{4}{5}$ , again stressing the importance of checking work and rereading questions. Some candidates stumbled upon an answer of  $\frac{4}{5}$  by following an incorrect method ( $£400 - 80\% = 320$ ) and consequently received no marks ( $40 + 25 + 15 = 80$ ;  $400 - 80 = 320$ ; answer  $\frac{320}{400}$  or  $\frac{4}{5}$ ).
- Q27** It was pleasing to see such an accessible question at the very end of the paper and many of the better candidates correctly found Class B had the highest percentage attendance, showing an appropriate method to justify their answer. Many weaker candidates who persevered with the paper picked up some marks in this question also, for correctly converting some or all the fractions to percentages. A common incorrect approach was for candidates not to convert to percentages but to attempt comparisons relating to 3 candidates being absent in each class but no progress was made.

## Assessment Unit M2 Foundation Tier

### Unit Overview

This was an ideal paper for candidates sitting their first formal GCSE examination in mathematics. There was little evidence of any misunderstanding, with almost all candidates making a reasonable attempt at most of the questions.

Almost all candidates seemed to have a calculator, with pencil and paper methods seen in much smaller numbers than in previous years. Written explanations and reasoning were generally of a good standard. The quality of written numerical methods continues to improve with most working easy to read and follow. Teachers should, however, make candidates aware that when they write down 2 or more alternative methods, the poorest one will be marked. There was evidence that some centres may have decided to 'play safe' by entering candidates for M2 who could easily have secured a Grade B had they been entered for the M3 examination. Marks of over 80 were common in this series.

- Q1** A straightforward start to the paper with most candidates securing full marks. Of the errors which did appear, the most common was offering '- 800' as the answer in Part (c).
- Q2** While many candidates had a clear understanding of range and mean, some did confuse them. A disappointing number of candidates seemed not to realise that the mean should have been left as 27.5, choosing instead to round their answer. It may be that they thought 'age' could only be given as a whole number.
- Q3** This was surprisingly poorly answered and is an area that may need some focus from teachers in advance of future examinations. It is clear that many candidates are unable to describe and recognise rotational symmetry.
- Q4** In Part (a) most candidates were able to convert the fraction for bowling into 40% or 0.4 and realised that the statement was correct. It was pleasing to note that in some cases where their conversion was incorrect, candidates did go on to give a 'correct' conclusion which followed from that error.
- A surprising number of candidates failed to secure the mark in Part (b) despite it being a relatively straightforward calculation.
- Q5** Most candidates showed clear working for this question, allowing those who completed the first step of multiplying £45.50 by 26 to get 2 of the 3 available marks, even if they obtained an incorrect answer. Confusion remains for a number of candidates who cannot tell whether their calculator is displaying a decimal point or a separator comma.
- Q6** As expected, there were a number of candidates who ignored the formula completely and instead chose to find the area of the rectangle in Part (a).
- In Part (b) many failed to double the 6.1m before subtracting. A small number also obtained the correct answer in their working, but then doubled it.
- Q7** This was generally well answered with most candidates understanding the difference between area and volume.
- Q8** It was pleasing to note the frequent occurrence of clear, concise working for this question which was generally well answered. Equally pleasing was the realisation from candidates that they needed to give their answer as a whole number, with almost all rounding correctly.

- Q9** This question highlighted the fact that a significant number of candidates at this level are unable to identify angles using 3 letter angle notation. Many hedged their bets by writing down all 3 angles on the answer line when they were unable to identify which one they were actually being asked for.
- Q10** The most common error was mixing up the lengths, although many candidates benefitted from the fact their working was clear, allowing markers the opportunity to award follow through marks.
- Q11** There was evidence of some candidates attempting to incorporate the shaded squares into their drawing of the side elevation. Common errors included drawing the front elevation or the elevation from the other side. Very few 3D drawings were seen, so almost all candidates at least had the idea of what an elevation should look like.
- Part (b) was very poorly answered, with a significant number of candidates stating how many small cubes were needed to make a cuboid rather than a cube.
- Q12** Most candidates gained 1 for having the 3 outside the circles. Many then chose to write 6 into the 'music only' section, but were still able to get the overlap correct.
- Q13** This was a slight change to the more traditional pie chart question, but was straightforward and allowed many candidates to experience success. Most candidates tended to work with either the numbers or the angles and it was disappointing that, when an error was made in their calculation, they followed that through to the other column, failing to spot that both were incorrect.
- Q14** For some candidates, the furthest they got with this question was working out the area of the rectangle. There was some evidence of the use of an incorrect formula, which was not followed. Those who had the formula correct tended to go on and secure full marks. A number did not include units or used incorrect units. Rounding tended to be correct in most cases.
- Q15** Part (a) was well answered, with most able to find the sale price correctly. In Part (b) it was disappointing to see the number of candidates who thought it was fine to find an amount other than £51, not realising that they were being told this was correct. While some candidates gave very good written explanations for Part (c) they did not back that up with calculations and did not score full marks.
- Q16** Most candidates made a good attempt at drawing the stem and leaf diagram, with those who drew a 'rough' version first, tending to be more accurate. In Part (d) some candidates who had an incorrect stem and leaf diagram gave a 'correct' median, highlighting that they had worked it out using the list rather than their diagram as instructed.
- Q17** Despite some questionable rounding, particularly for Class C, a majority of candidates obtained full marks in this question, with clear working shown.
- Q18** Very few candidates opted to work with fractions in this question. That led to problems for some straightaway when the only fraction they could correctly convert was the quarter. Of those working with decimals and percentages, some failed to realise they needed to subtract their total from 1 or 100 before converting back to a fraction. In a small number of cases there was a serious error when candidates chose to use a compounding method.
- Q19** This question was poorly answered, with few correct answers seen. In Part (a) the majority of candidates didn't realise that they needed to work backwards to find the height, while in Part (b) there was little evidence that candidates knew Pythagoras' Theorem was being tested. Of those who did make an attempt at Part (b), some used an incorrect 'base' for the triangle, but lost only 1 mark as their working was clear and they followed their error correctly.

- Q20** Part (a) was straightforward, but few candidates were able to express the number in (b) as a product of prime factors. A variety of good explanations were offered in Part (c), although few who gained the mark referenced the fact that it was because all the prime factors were not squared.
- Q21** Very few correct answers were seen in this question. Most candidates were unable to convert 24 minutes into hours correctly. On a more positive note, it was clear that most knew the formula.
- Q22** Most candidates secured the first mark by correctly finding the decrease. The most common loss of marks was due to the answer not being rounded to 1 decimal place, or candidates simply putting one number over the other without really knowing what they were doing.
- Q23** Many candidates went for a 'simple interest' approach here, simply adding on 1.96 repeatedly. Of those who realised the correct 'compound interest' method, some rounded much too crudely. It often made no difference to the final answer, but candidates should be reminded that accuracy is key, particularly in 'middle' steps of calculations.
- Q24** Most candidates realised that they needed to use the blank columns in the table, but a variety of 'midpoints' were used, including lower and upper boundaries. Some used the 3<sup>rd</sup> column in the table to find the correct totals, but then went on to do further irrelevant work in the 4<sup>th</sup> column. Many candidates did not know how to find the mean once they had found the total, with some making the common error of dividing by 5 as there were 5 groups. In some cases, candidates appeared to try and find the median class rather than the mean.
- Q25** Very few candidates spotted that her father's age was outside the range of the observed values, with the majority simply reading from the line of best fit and confirming that the readings were correct.
- Q26** A correct equation was rarely seen here, despite the fact that many candidates were able to find the correct answer. Those who did form the equation with letters on both sides generally went on to solve it correctly.



## Assessment Unit M3 Higher Tier

### Unit Overview

Markers were pleasantly surprised at the good standard of responses especially considering the potentially negative Covid effect on the candidates' performances. The paper offered most candidates the opportunity to attempt most of the questions quite successfully, with only a few examples of candidates who might have been better entered at a lower level. There were a sufficient number of accessible questions at the start of the paper which allowed the candidates to score well and build up a good level of confidence as they progressed through the paper. Also, there were fair but challenging questions later on to allow the more capable candidates to stretch themselves and achieve some very high percentage scores. For a number of candidates, it was disappointing to come across many simple calculations performed inaccurately given that calculators could and should have been used. In summary, this paper allowed candidates of differing abilities to access a range of marks accordingly, candidates who generally had been well prepared for this paper.

- Q1** The paper started well with the vast majority of candidates presenting clear, concise, correct working for this question.
- Q2** This question was completed correctly by a significant majority of the candidates with a minority forgetting to divide by two at the end and a minority unable to substitute the given values in the formula.
- Q3** The first part was very well answered and about half the candidates were able to proceed completely through the second part. Only a minority showed little understanding of simple triangle geometry.
- Q4** This question proved the most accessible on the paper with completely correct answers offered by a huge majority of the candidates. Very few did not score any marks on this question.
- Q5** More than three quarters of the entry were able to draw the side elevation and most of the rest made some attempt. Part (b) was not so well answered, with a significant number of candidates stating how many small cubes were needed to make a cuboid rather than a cube.
- Q6** Most candidates gained 1 for having the 3 outside the circles and just over half the candidates entered the other two values on the Venn diagram correctly also.
- Q7** This was a slight change to the more traditional pie chart question, but was straightforward and allowed many candidates to experience success. Three quarters gained full marks but about one sixth did not find a reasonable starting point.
- Q8** This question was generally well answered but many candidates lost the final mark because they omitted the units specifically required with the answer.
- Q9** Part (a) was well answered, with most able to find the sale price correctly.  
Part (b) was nearly as well answered with clear working often shown. It was encouraging to receive explanations with working presented by 60% of the candidates for Part (c).
- Q10** Most candidates made a good attempt at drawing the stem and leaf diagram, with the majority calculating the median from it, having also completed the descriptive parts of the question well.
- Q11** The vast majority of candidates obtained full marks in this question, with clear working shown.

- Q12** About two fifths of the entry were able to draw the line graph, about a third did not know how to attempt it, while the remainder generally only plotted one point correctly.
- Q13** This question was relatively poorly answered, with just over half the candidates unable to access any marks, even when entering the values in the formula for the area of a trapezium. Most of the remaining candidates did score full marks in Part (a). In Part (b) even more candidates did not recognise the required use of Pythagoras, while the majority of those who did, used an incorrect 'base' for the triangle, but lost only 1 mark as their working was clear and they followed their error correctly.
- Q14** Part (a) was straightforward and very well answered and two thirds of the candidates were able to express the number in (b) as a product of prime factors. Most of these also offered an acceptable explanation in Part (c).
- Q15** Approximately one third of the candidates calculated the average speed correctly but over half did not appear to appreciate that unit conversion was necessary and often divided 5 by 24.
- Q16** Just under half the candidates secured full marks, with common errors being the lack of any attempt to use subtraction or an error in rounding to 1 decimal place.
- Q17** It was encouraging to receive well-presented correct answers from about half the entry. About half the remainder gained a mark for calculating the distance after one year, but not spotting the 'compound' nature of the question.
- Q18** This question drew a very mixed response with many candidates making good attempts to complete the table and calculate the mean, with a small minority not knowing where to begin.
- Q19** Very few candidates spotted that her father's age was outside the range of the observed values, with the majority simply reading from the line of best fit and confirming that the readings were correct.
- Q20** A correct equation was offered by less than a quarter of the candidates while over 60% did not form an equation at all and thus gained no marks.
- Q21** The majority of the candidates gained full marks but about a quarter could not use the given formula correctly.
- Q22** It was not obvious to many that trigonometry would be useful in this question and only the best candidates gained full marks.
- Q23** In Part (a) the majority of candidates correctly found the IQR from the box plot as 13 and obtained the first mark but most then added this to 25 and drew the highest value as 38 rather than 48. In Part (b) very few candidates realised that extreme values were relevant to the question. In Part (c) the best candidates recognised the connection between 75% and the quartile.
- Q24** Just over a third of the candidates completed an accurate calculation in (a) and a similar number linked 'overestimate' with their sensible reason in (b). Many gave the same reason but incorrectly linked with 'underestimate'.
- Q25** This provoked quite a good response with varying levels of competence in dealing with the algebraic manipulation. A sizeable minority gained full marks.
- Q26** This question on reverse percentages was well handled by a reasonable proportion of the entry.
- Q27** Many found this final algebra question difficult but a pleasing minority gained full marks in (a) and about 10% simplified (b) correctly.

## Assessment Unit M4 Higher Tier

### Unit Overview

The performance of candidates in this paper was generally very good especially given the difficult circumstances faced by these candidates over the last two academic years. In the papers which this examiner marked, the marks ranged from 7 to 99, with many candidates achieving 50 and above. A small percentage of candidates scored below 20.

The general feeling from all examiners is that the paper was successful in allowing candidates of differing abilities to respond positively and most questions were attempted – it was unusual to see blank answer spaces. The questions that stretched the more able candidates were questions 16, 17, 19 and 23 and 24. There were also several reasoning questions on this paper and a lot of candidates struggled to use the correct terminology to explain their reasoning.

Presentation of work was satisfactory, however, greater care with writing letters and numbers more clearly and laying out work in an orderly manner can help gain more marks. Several markers commented on the standard of handwriting for the reasoning questions with some answers being almost impossible to read. Issues with reading questions carefully were also evident throughout – for example Question 4 asked for an answer to 1 decimal place but many candidates rounded to either 2 decimal places or to the nearest whole number.

Questions/topics which seemed to cause most problems in general were:

- Question 7 (scatter graph reliability – interpolation/extrapolation).
- Question 11 (box plots – mostly reasoning).
- Question 16 (setting up and solving a quadratic equation).
- Question 17 (surface area of a prism involving sectors of a circle).
- Question 19 (circle theorems with algebra).
- Question 21 (calculations with error bounds).
- Question 23 (solving an equation with algebraic numerators and denominators – mostly issues dealing with the subtraction and not using brackets).
- Question 24 (histograms and stratified sampling).

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.

- Q1** This problem-solving question on Pythagoras' Theorem was generally well answered with the majority of candidates obtaining at least 3 marks. However, even the very best of candidates were obtaining a final answer of '3' here by forgetting to halve the 4. Follow through marks enabled these candidates to get 3 marks. Some candidates set up Pythagoras' Theorem incorrectly, obtaining no marks after the first mark of the mark scheme while others tried to find the area of the trapezium.
- Q2** (a) The vast majority of candidates answered this question on product of prime factors correctly. However, some candidates included '9' as a prime factor.
- (b) Most candidates obtained the mark for this reasoning question using product of prime factors, however, explanations could be improved for future papers.

- Q3** In general, this question on average speed was answered well. The main issue for those who did not obtain full marks was changing 24 minutes to hours or not dealing with this at all and finding the average speed in km/min by simply dividing 5 by 24. This obtained no marks. Some candidates found the average speed in m/s, also obtaining no marks.
- Q4** This question on percentage change was answered very well with the majority of candidates obtaining full marks. Some candidates lost the last mark for not rounding their answer to 1 decimal place. Candidates should be encouraged to start their solution with the subtraction rather than placing one value over the other and then subtracting from 100. Failure to carry out the last step here results in no marks being awarded.
- Q5** This question on compound interest was answered well by most candidates. The most common error was using simple interest which only gained a maximum of 1 mark for 50.96. Some candidates miscounted the number of years after applying compound interest correctly three times and this was when the candidates used the year-on-year method rather than applying the formula i.e  $49 \times 1.04^3$
- Q6** The vast majority of candidates obtained full marks in this standard question on estimating the mean from a grouped frequency table. A small number of candidates used upper/lower boundaries or rounded their mid-points and were allowed follow through marks. Some candidates tried to use cumulative frequency and obtained no marks. Candidates should be encouraged to round their final answer to at least 2 decimal places in future. Rounding to the nearest whole number or writing the class interval after finding '6.18' obtained full marks but may not do so in future papers.
- Q7** This reasoning question on interpolation and extrapolation from a scatter graph is part of the new specification but was not answered well in general. Most candidates misunderstood the focus of the question and simply confirmed the readings were reliable as they matched the line of best fit. A very generous 1 mark was awarded in this case but in future candidates should be aware of interpolation and extrapolation when deciding on reliability of results using a scatter graph. Other common incorrect answers involved mentioning health problems or the sample size being too small.
- Q8** The majority of candidates obtained at least 3 marks in this algebra question on forming and solving a linear equation. Too many candidates lost the last mark as they didn't read the question carefully and did not find the perimeter. Some candidates only tried to use the triangle by starting with  $2c + 11$  and then writing  $c = 5.5$  and perimeter equals 22 – gaining no marks. A small number of candidates used the area of the square rather than the perimeter and gained no marks either.
- Q9** This was one of the best answered questions on the whole paper with most candidates obtaining full marks. Almost all candidates used the correct formula for the surface area of a sphere which is given on the formula sheet. A very small number of candidates used  $r = 12$  gaining no marks and some candidates left their answer in terms of  $\pi$ .
- Q10** The majority of candidates recognised this as a trigonometry question with most candidates knowing to start with the tan ratio. Some candidates found the hypotenuse using Pythagoras' Theorem and then used either sin or cos correctly. Common mistakes were starting with sin or cos; finding the smallest angle; not doubling 61.9. A small number of candidates thought this was 'an angles in a polygon question' and did not attempt to use trigonometry.

- Q11 (a)** The majority of candidates correctly found the IQR from the box plot as 13 and obtained the first mark but most then added this to 25 and drew the highest value as 38 rather than 48.
- (b)** There was a mixture of responses for this reasoning question explaining why it is better to use the IQR rather than range. 'More accurate' and 'better representation' were common incorrect answers here. However, a lot of candidates did use the terms 'extreme values', 'outliers' or 'anomalies'.
- (c)** This question on knowing the percentage of candidates below the upper quartile is 75 was poorly answered in general.
- (d)** The majority of candidates were able to obtain 1 mark here for trying to compare the two classes using the two box plots. Candidates should be comparing an average (median here) and a measure of spread (IQR or range) for full marks. A small number of candidates just stated the median or IQR range for each class rather than comparing which is higher/lower.
- Q12 (a)** This question on using a sample to estimate the number of the population owning a smartphone was answered very well in general. A small number of candidates rounded their fraction/percentage before multiplying by 15000 and obtaining an answer close to 11800 but not exactly, therefore losing the mark.
- (b)** The majority of candidates were able to explain this was an overestimate as 17-year-olds are more likely to own a smartphone than the elderly for example. A small number of candidates said this was an overestimate but struggled to explain why correctly. Others said underestimate but then had the correct explanation for overestimate, but this obtained no marks. Some candidates started with yes/no instead of overestimate, again obtaining no marks.
- (c)** The majority of candidates who answered (b) correctly were able to say a better sample would involve a variety of age groups.
- Q13** This standard question on linear equations with fractions was very well answered in general. There were a variety of correct methods used with only a small number of minor mistakes throughout and a lot of candidates obtained full marks. A small number of candidates failed to deal with the RHS of the equation or dealt with it incorrectly. This question is always answered better when it is an addition rather than a subtraction.
- Q14** The majority of candidates obtained full marks in this reverse percentages question. The most common mistake was finding 3.5% of £150075 and subtracting the answer from this, obtaining no marks.
- Q15 (a)** This question on expanding two brackets was answered very well with the vast majority of candidates knowing to multiply four terms. Some careless mistakes were made such as an incorrect +/- sign or a more serious error of only having  $6x$  for the first term. A small number of candidates tried to factorise their expansion again.
- (b)** Another well answered algebra question in which most candidates knew to use the difference of two squares along with basic factorisation and to cancel correctly.
- (c)** This question on factorising a quadratic was answered quite well. Candidates who used the full method involving splitting the middle term and factorising using grouping usually fared better than those using the factorising by inspection method. A small number of candidates went on to let this expression equal zero and solve it.

- Q16** This question on setting up and solving a quadratic equation differentiated the more able candidates from the rest. Those who were able to obtain the correct first line went on to obtain full marks, recognising a positive answer was required. Common mistakes that allowed for a maximum of 5 out of 6 marks were forgetting to use the '4'; having the '4' on the wrong side of the equation; incorrectly expanding  $8(24 - x)$ . A small number of candidates obtained no marks here as they could not start the question, while others only obtained 1 mark for either  $8(24 - x)$  or  $4x^2$ .
- Q17** Only the more able candidates obtained full marks in this question on finding the surface area of a prism involving sectors of a circle. However, the majority of candidates were able to get 3 or 4 marks for correctly finding the area of one sector and one rectangle. The main issue here was finding the surface area of the curved face. Some candidates misread the question and attempted to find the volume. Other mistakes were attempting to use trigonometry when this was not required or finding the surface area of a cone.
- Q18** In this question on finding the equation of a line using a perpendicular gradient, the vast majority of candidates were able to obtain the first mark for finding the correct perpendicular gradient; however, only the more able candidates could then find the equation correctly by substituting in the given coordinates.
- Q19** Only a small number of candidates obtained full marks in this circle theorems question. Candidates struggled to deal with the use of algebra as well as giving incorrect reasons for each stage of their working. A lot of the time candidates just wrote down a list of reasons such as AST, or a tangent meets a radius at right angles, but they failed to match this to any angles. Some candidates ignored the algebra and tried to pick numbers for the angles. Marks were also lost for not correctly stating a reason, such as, a tangent meets the 'circumference' at  $90^\circ$ .
- Q20** This factorisation question involving 2 variables was well answered in general. Similar to Question 15(c), candidates who used the method of splitting the middle term along with grouping were more successful than those trying to factorise by inspection. The most common errors were splitting the middle term incorrectly or incorrect signs in the final answer. Candidates should be made aware of partial marks being available for attempting the method stated and any mistakes in attempting to use the inspection method usually result in zero marks.
- Q21** Only a small minority of candidates obtained full marks in this question on error bounds. Some of the more able candidates lost the last mark for not being able to find 13 minutes correctly from a decimal number of hours – 2.21 hours was more commonly written as 2 hours 21 minutes. Most candidates knew to use the minimum distance and correctly used 105, however the main issue was finding the correct maximum speed as 47.5.
- Q22** This algebra question was answered very well in general with a lot of candidates obtaining full marks. Almost all candidates who successfully factorised the numerator and denominator went on to cancel down correctly. Most candidates could factorise the denominator correctly using the difference of two squares, with most mistakes being made trying to factorise the numerator using the method of grouping.

- Q23** This question on solving an equation with algebraic fractions in numerators and denominators proved to be the question in which most candidates struggled to obtain full marks. The vast majority of candidates knew how to start the question by getting a common denominator for the fractions, however, candidates mostly struggled to deal with subtracting all terms from expanding  $(2x+1)(x+4)$ . Candidates are advised to use square brackets in this case. The most common mistake was only subtracting the first term of the expansion which leads to a quadratic with no real roots. In this case candidates could only obtain a maximum of 4 out of 8 marks. Other common mistakes were mostly simple arithmetic errors or when attempting to let the equation equal zero. A small number of candidates who were able to deal with the subtraction correctly went on to lose the last mark for not rounding to 2 decimal places correctly.
- Q24 (a)** This histogram question also differentiated the more able candidates from the rest. The main issue was not being able to find the correct scale on the frequency density axis and therefore losing most, if not all, marks. Some of the less able candidates could find the '420' frequency but struggled with the fractional part of the last bar to obtain '240'.
- (b)** The majority of candidates who obtained full marks in Part (a) also obtained full marks in Part (b). However, candidates who obtained no marks in Part (a) usually went on to obtain no marks in Part (b). However, a number of candidates who obtained no marks in (a) were able to get an answer of '168' in (b) using their correct proportions in a stratified sample and hence obtained 4 marks using follow through marking. Most candidates could not understand how to start this question.

## Assessment Unit M51 Foundation Tier Non-Calculator

### Unit Overview

This proved to be a challenging paper for many candidates at this level. Some of the early questions examining candidate understanding of number were poorly answered by weaker candidates which may have affected their confidence and their overall performance on the paper. Marks ranged from single figures to over 40 and 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. Several candidates did not have access to a ruler, stating so explicitly on their paper, and were unable to attempt the scale drawing question. A minority of candidates' handwriting was very difficult to read and this showed a marked deterioration over previous 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.

It was pleasing to see so many candidates showing their working out. Part marks were awarded for correct method shown throughout the paper where more than 1 mark was available for a question or question part.

- Q1 (a)** This 'incorrect subtraction' problem was a rather challenging introduction to the paper with weaker candidates mostly unable to correctly identify the necessary digit. A small majority of the cohort, however, were able to identify the correct '3' as the answer.
- (b) (i)** Again many candidates struggled to identify '8' as the digit that was wrong in the division shown. Knowledge and understanding of this basic arithmetical skill was only demonstrated by about half the cohort.
- (ii)** Candidates who were correct in Part (b)(i) were generally correct in this part of the question too as they had already produced the correct answer of '139' to the division. Many candidates seemed to just guess an answer.
- Q2 (a)** The majority of candidates gained 1 mark for showing correct method in finding the total weight of the pizza. Disappointingly, however, more than one-third of candidates were unable to correctly multiply 128 by 8 and many arithmetical errors were seen. Weaker candidates attempted to find the total weight by writing down 128 eight times and adding these, often unsuccessfully.
- (b)** This challenging question at the start of the paper was rarely answered with understanding. Many candidates ignored the instruction to estimate and often attempted to sum either 5 or 12 lots of 2.96. For those who did estimate, a common incorrect response was  $5 \times 3 = 15$ . Candidates in this case either misunderstood or misread the question and failed to realise they needed to work out that there are 12 lots of 5 seconds in one minute. Only the strongest candidates were able to produce the required answers of 36 or 30 by estimation.



- Q3** (a) This was a much more accessible question for candidates at this level with most respondents identifying Year 10 as the year group to which a candidate chosen at random is most likely to belong. A few candidates wrote down the number of candidates rather than the year group but were allowed the mark.
- (b) Again, a significant majority of candidates had no problem identifying the year group to which a randomly chosen candidate is least likely to belong.
- (c) This proved to be a good discriminator of ability with some very clear explanations from better candidates earning the available mark. For candidates not realising why 47 candidates could not be split into the same number of boys as girls, a generous mark was allowed for responses such as 'we don't know how many boys or girls there are in Year 12'. The most common incorrect answer was 'there is not enough information'.
- Q4** (a) This was another challenging question for candidates at this level though it was pleasing to see such a lot of correct (or partially correct) responses. A fully correct solution required writing a '0' into the final box and leaving the other box blank, but generous marking allowed the available mark for seeing a '0' in the final box and any single digit in the middle box.
- (b) Better candidates answered this part of the question well and realised that the new number should be 83000. Weaker candidates were mostly unable to understand what was being asked and either left the boxes blank or added random digits. This part of the question, along with Part (a) proved to be a good discriminator of ability.
- Q5** (a) This straightforward question on reflection was well answered by a significant majority of the cohort. The most common incorrect response showed a translated rather than reflected image, though this was seen only on a handful of scripts.
- (b) This was another relatively straightforward question which tested knowledge of enlargement. The majority of candidates were able to correctly answer with '3' and generous marking (allowing 'x3', 'times 3' etc.) ensured almost two-third of candidates gained the available mark.
- Q6** This question proved to be one of the least accessible questions on the paper for candidates at this level. There were very few correct answers to either part and a significant majority of candidates showed no understanding of the concept tested. Some candidates attempted to find solutions by carrying out manual calculations but none progressed to find either the '25' required for Part (a) ( $54 \times 4 \times 25 = 5400$ ) or the '60' required in Part (b) ( $68 \times 40 + 68 \times 60 = 6800$ ).
- Q7** (a) This question was a good discriminator of ability and better candidates were able to demonstrate their understanding of finding fractions of amounts and earn 2 marks. The correct answer of 10000 was given on a large number of scripts while, in some cases, a method mark was allowed to candidates whose work showed an arithmetical error. Some candidates misread 45000 as 4500 or 54000, but were awarded a mark if their answer correctly followed for  $\frac{2}{9}$  of 4500 or 54000. A small minority of candidates attempted to change  $\frac{2}{9}$  into a decimal and then multiplied 45000 by this, but were unable to progress to the correct answer.

- (b) Only the strongest candidates were successful in this question which required finding 30% of 45000. A number of candidates were clearly confused by the question and attempted to find 30% of 65, possibly as a result of misreading '30% of the people in Arrondale are over 65'. Others attempted to find 30% of their answer to Part (a) or continued to work with their previously misread value for '45000'.
- Q8** This was another challenging question on 'number' which proved to be a good discriminator of ability. Candidates who understood to divide '5238' by '6' and '9' were mostly successful in producing the answer of '97' and were awarded both of the available marks. Common incorrect approaches saw candidates trying to divide '5238' by '4' and '9' as per Chloe's example. Other candidates ignored the instructions and attempted to divide by '54' gaining no marks.
- Q9** This question testing percentages was well answered by relatively few candidates, but pleasingly most of the cohort were able to access at least one of the three available marks. Better candidates were able to find 15% of 800 as 120 followed by 10% of 120 as 12 and take this way from 800 to produce the required answer of 788. A common incorrect response saw candidates finding 120 for the first mark, then finding 10% of 800 rather than 120, leading to  $800 - 80 = 720$ , which received no further marks.
- Q10** This sequencing question was well answered by most of the cohort with many fully correct responses seen earning both of the available marks. A follow through mark for correctly multiplying an incorrect first value by 3 and subtracting 5 was allowed.
- Q11 (a)** This question on listing outcomes was very well answered by most of the cohort and on occasions where full marks were not awarded, it was mainly due to carelessness or rushing rather than candidate lack of understanding.
- (b)** Candidates who answered using fractions or decimals were mostly correct in recording the probability of (B, H). However, as in previous examination series, many candidates are still giving answers in words, 'unlikely' being the most common incorrect response to questions where fractions or decimals are expected.
- (c)** Candidates who answered Part (b) correctly generally were correct in this part also. Again, many worded answers were seen instead of the expected fraction. The most common incorrect response was 'likely' or 'similar'. Some candidates who miscounted the total outcomes lost the mark in Part (b) for having a wrong denominator, but were able to access the marks available here as they were not penalised twice for having the same wrong denominator. Another common incorrect response was  $\frac{7}{10}$  which came from double-counting.
- Q12 (a)** The majority of candidates correctly identified the stage of the distance-time graph that showed when Mike was repairing a puncture. Generous marks were allowed for candidates who referenced stage B using co-ordinates or an appropriate time or distance.
- (b)** There was a lot of work required for just one mark in this part of the question. Only a few candidates successfully found the average speed of 18 mph for Stage C. A small minority of candidates indicated 20 minutes and 6 miles in the workspace but were unable to progress to finding the correct speed.
- (c)** The final part of this question proved to be a good discriminator of ability with some of the better candidates drawing the correct line for the final part of the journey. One mark was occasionally awarded for appropriate method, such as working out that 7 miles at 14 mph takes 30 minutes. A minority of candidates drew their line upwards from the end of Stage D but quickly ran out of graph. However, 1 mark was allowed for candidates drawing a line from the end of Stage D to any point on the graph at 75 minutes.

- Q13 (a)** It was good to see so many accurate and well-constructed scale drawings at this level with many candidates across the ability range being awarded most of the available marks. Some candidates failed to start their drawing at B but if they produced an accurate scale drawing they were not penalised. Disappointingly, a number of candidates did not have access to a ruler which meant both parts of this question were inaccessible.
- (b)** Better candidates had no problem measuring their 'AB' and finding its actual length by multiplying by 50. Follow through marking ensured candidates with incorrect scale drawings in Part (a) who demonstrated an understanding of what was required often received a mark.
- Q14 (a)** This question was another good discriminator of ability and it was largely the better candidates who demonstrated an understanding of rescaling the given recipe for scones. A small minority of candidates approached the problem by dividing 40 by 4, then multiplying by 5, which is the method referenced in the mark scheme. A commonly seen approach involved candidates dividing 40 by 16, then multiplying by 20. Few candidates, however, were able to divide 40 by 16 correctly to produce 2.5. More often than not candidates using this method were unable to deal with the remainder of 8 and ended up multiplying 2.8 by 20. Similar approaches led to finding 1 scone as requiring 2.4g of butter (if dividing 20 by 8 and not being able to deal with the remainder of 4) or 2.2g (if dividing 10 by 4 and being unable to deal with the remainder of 2).
- (b)** This proved to be a very challenging question for even the strongest candidates in the cohort. Few fully correct responses were seen. Most answers indicated that it wasn't possible to make 20 scones with 300g of flour but much of the method seen was incorrect. If correct method was shown it was often accompanied with arithmetical errors. The most successful candidates solved the problem using the method referenced in the mark scheme, but many encountered difficulty dividing 250 by 4 and multiplying by 5. A common incorrect answer was 'no' with 311g rather than 312.5 g (from  $\frac{250}{4} = \frac{125}{2} = 62 \text{ R}1; 62.1 \times 5 = 311$ ). A variation of this saw candidates adding 62.1 onto 250 to get 312.1g. An alternative approach saw a very small number of candidates calculating that 300g would only make 19.2 scones. The most entertaining answer given was, 'yes Paul can make 20 scones but they'd have to be smaller scones'.
- Q15 (a)** Candidates with an understanding of translation had little difficulty translating P 6 units left and 5 units down.
- (b)** Better candidates were able to rotate P correctly 90° anticlockwise about the origin. It was pleasing to see that many weaker candidates across the cohort were able to access 1 mark for correctly rotating the shape about the wrong point. A handful of candidates rotated the shape clockwise about the origin, while significantly more rotated it clockwise about the wrong point.
- Q16** This final question proved challenging for most of the cohort. Many candidates with incorrect answers failed to show any working and consequently could not be awarded a method mark. A sizeable number of candidates who understood what was required had difficulty with the '0.2' and treated it as '0.02' when summing the given probabilities. This led to a total of '0.57' rather than '0.75' and an answer of '0.43' rather than '0.25'. Finally, '0.43' was allowed 1 of the available 2 marks.

## Assessment Unit M52 Foundation Tier Calculator

### Unit Overview

This proved to be a more accessible paper than the non-calculator component for many candidates at this level. Most of the earlier questions allowed less able candidates to pick up marks consistently question by question and ensure that their confidence was not adversely affected. Although marks again ranged from single figures to scores in the forties the median score was slightly higher on this component than on GMC51. 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.

Some candidates clearly had no access to a calculator which disadvantaged them on a number of questions across the paper and probably led to lower marks than they were capable of achieving. A minority of candidates' handwriting was very difficult to read and this showed a marked deterioration over previous 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.

It was pleasing to see so many candidates 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 few candidates gave up when the questions started to become more challenging.

- Q1**
- (a)** Only better candidates were able to take a correct reading from this gauge.
  - (b)** A significant majority of candidates correctly recorded the height of the man as 176 cm. Incorrect responses included 174.5 and 175 cm, showing either a lack of understanding of the scale used or a lack of attention to detail.
  - (c)** This was another very well answered question on reading scales. The correct answer of 725 was seen on a large majority of scripts.
- Q2**
- (a)** A very disappointing overall response to this straightforward question on probability was seen throughout all ability levels within the cohort. Many candidates simply treated the two outcomes, that it will either rain or not rain, as equally likely outcomes and answered 'True' (the probability of rain is evens).
  - (b)** This was the most successful part of the question with a majority of candidates disagreeing that the probability of rolling five on a fair dice is likely.
  - (c)** Disappointingly, two-thirds of candidates were unable to recognise that picking an apple at random from a selection of 10 items of fruit, where 4 items were apples, is unlikely. Although there were more apples in the graphic than any other type of fruit shown, it is expected that candidates at this level should have a better understanding of likelihood.

- Q3** (a) Most candidates had no problem expressing 52.3 in terms of tens, units and tenths. A few transcription errors were observed but overall this was a very successful question.
- (b) Roughly half the candidates were able to increase 21.48 by  $\frac{1}{10}$ , either by adding 0.1 or increasing the amount by 10%.
- (c) Decreasing 3.60 by  $\frac{1}{100}$  proved slightly less accessible to candidates than the question posed in Part (b). Better candidates were able to successfully find the required answer of 3.59 (or 3.564 if they reduced 3.60 by 1%). It was noted on several scripts that candidates answered £3.59, perhaps helping to explain why this part of the question proved more accessible than the previous part (candidates may have thought of 3.60 as money and removed 1p).
- Q4** (a) It was disappointing to see so many incorrect answers to this most basic of compass direction questions. Moneyreagh is north of Saintfield but the most common answer given was south. Candidates at this level should be giving due consideration to where they are being asked to give the direction 'from'.
- (b) Again, it was disappointing to see a large proportion of the cohort giving incorrect responses to another straightforward question on compass directions. Comber and Lisbane were common incorrect answers and both lie in a north easterly (rather than northwesterly) direction from Ballygowan. There is some sympathy for candidates answering Carryduff, which does at least lie to the north and west of Ballygowan, but as only 1 mark was available the correct answer of Moneyreagh was required.
- (c) Ironically, the most difficult part of this question was the best answered. Many candidates earned both marks for measuring the distance on the map between Carryduff and Balloo accurately and converting their answer to miles. Common incorrect responses saw candidate measurements given in centimetres rather than miles and 1 mark was awarded. Other candidates, with an incorrect measurement, were generously awarded 1 mark for writing miles as the correct unit.
- Q5** (a) Better candidates accessed both of the available marks for finding half of 454 and subtracting 185 to get 42. A common incorrect method saw a significant number of candidates subtracting 185 from 454 and either answering 269 or halving this amount. A generous one mark was allowed for candidates who correctly found 227, the number of grams in half a pound.
- (b) A surprising (and extremely pleasing) number of candidates, across the ability range, were able to convert 20 miles into 32 km correctly. Candidates may well have been helped by the fact that the additional support materials provided the conversion needed, though not all candidates will have made use of this aid. One candidate wrote down and used the 1 mile = 1.609 km conversion and correctly answered 32.18 km.
- Q6** (a) Most candidates identified '24' as the next term in the given sequence.
- (b) Plenty of correct answers were seen and a generous allowance of 1 mark for any answer with a last digit of '9' ensured that this was a well answered question. A sizeable number of candidates wrote all 30 terms of the sequence out and an obvious incorrect response was '4'.

- Q7 (a)** It was pleasing on one hand to see so many correct answers of  $\frac{4}{7}$  but discouraging to see a large number of respondents using words, rather than fractions, to describe probability. Some candidates who identified  $\frac{4}{7}$  answered 0.57 or 0.6 and were not penalised.
- (b)** Most candidates had no problem identifying the correct answer of zero as no 7 year olds were in the playground. Again, many candidates gave an answer in words, but in this case 'impossible' was generously awarded a mark. A common response was  $\frac{0}{7}$  and while not encouraged, it was allowed the available mark.
- (c)** Candidates who gained marks in the earlier parts of this question mostly gained a mark for correctly answering  $\frac{6}{7}$  for the probability that the child chosen is not 11 years old. A number of candidates, again, gave answers such as 'very likely' and lost the mark. Incorrect denominators used in Part (a) were not penalised a second time if they reappeared here and a generous mark was allowed for answers that could be followed through.
- Q8 (a)** Just under half of the candidates were able to correctly interpret the scale and read off the required answer of 0.8 or equivalent. Common incorrect answers given included 0.9 and  $\frac{3}{4}$ .
- (b)** Most of the cohort correctly listed the six possible combinations and it was pleasing to see a large number doing so sequentially. Incorrect responses generally identified the correct combinations but introduced some spurious ones such as '256' or '273' etc. Some candidates listed less than 6 combinations but were awarded a mark if they had at least 4 correct combinations and no additional incorrect combinations. A few candidates repeated some of their combinations, suggesting they had neither checked their answer nor applied a sequential listing method.
- Q9 (a)** This question proved to be a good differentiator of ability with only the very best candidates correctly identifying (30, 10) as the wrong point on the conversion graph.
- (b)** Again, only the strongest candidates were able to draw the correct line. Generous application of the mark scheme allowed a small proportion of the cohort to gain one mark for an acceptable straight line through some of the points. Many candidates failed to draw any line. It was evident that a small number of candidates had no ruler and freehand drawn lines were seen on occasion.
- (c)** Better candidates earned the final mark available for this question by correctly converting 88 cm to inches by using their conversion graph. If a graph had not been drawn no marks could be awarded for a conversion answered. Incorrect lines in Part (b) were followed for 1 mark, but most candidates who produced incorrect lines failed to gain the available mark as they often misinterpreted the scale. Common incorrect responses included '38' and '39', which mainly arose from misunderstanding either the vertical or horizontal scale, but mostly the horizontal scale.

- Q10 (a)** Many candidates failed to spot how this pattern developed and incorrect responses were the norm. For candidates who decided to work up from 4 trapeziums a considerable number were allowed 1 mark for correctly identifying 5 trapeziums as having length 60 cm. Better candidates were able to produce the required answer of '110'.
- (b)** Just over two-fifths of the candidates were able to produce '22' for the number of white triangles in pattern 10 but few others were successful. Candidates who approached the problem by working up from pattern 3 and 8 triangles to pattern 4 with 10 triangles and progressing to patterns 5, 6 etc. up to 10 were successful in a very small number of cases.
- Q11** This question was a good discriminator of ability and as candidates had to show working, only the better candidates were able to access all 4 marks with complete and correct method shown. It was pleasing to see many candidates across the ability range accessing 2 marks for showing evidence of comparing the 200g and 500g sizes correctly. The 900g size often confused candidates and they were unable to convert this size appropriately on the whole. Candidates who found the price per 100g for each size were most successful across the cohort. Candidates who calculated the number of g/£ for each size (143, 133 and 138) were also generally successful in gaining all 4 marks. A lot of arithmetical errors and truncated values were evident in a large number of responses. A common incorrect response, gaining no marks, saw candidates multiply the number of grams by the price for each of the sizes, then attempt to compare their respective values.
- Q12** This was a very accessible currency conversion question towards the end of the paper which allowed candidates of differing abilities to access up to 3 marks. Many fully correct responses were seen, though some candidates did answer £7.42 euro, losing sight of what they were doing. Some arithmetical errors were seen but could often be followed with a 1 mark penalty. The most common incorrect response followed from candidates who divided by the exchange rate rather than multiplying by it.
- Q13** Both parts of this question on bounds were beyond the capabilities of the vast majority of this cohort. Few correct answers were seen for either part.
- Q14** Only the very best candidates were able to gain more than one of the four available marks in this question testing both fractions and ratio. Most candidates were able to successfully resolve the fraction component and calculate 108 girls and 72 boys, gaining 1 mark. Few candidates were able to deal with the 4:3 ratio given. A common incorrect approach saw candidates divide the 280 adults by 4 and then by 3 to find the number of men and women as 70 and 93.3 Others divided by 4 to find the number of men as 70, then subtracted this from 280 to produce 210 women.
- Q15** This question was a good discriminator of ability and some of the better candidates scored all three marks. A generous 1 mark was allowed for candidates totalling the shown angles correctly to  $469^\circ$ . A small minority of candidates subtracted their '469' from an incorrect pentagon angle sum, often  $500^\circ$  or  $560^\circ$ , rather than  $540^\circ$ .
- Q16** This was also a good discriminator of ability and better candidates could often access all 3 of the available marks, or in many cases 2 marks. Some candidates were confused by the word 'estimate' in the question and rounded the given values (0.025 to 0.03 and/or 1800 to 2000). Common incorrect answers which were allowed 2 marks included 1740 ( $2000 \times 0.03 = 60$ ;  $1800 - 60 = 1740$ ) and 1746 ( $1800 \times 0.03 = 54$ ;  $1800 - 54 = 1746$ ). An answer greater than 1800 was awarded no marks.

## Assessment Unit M61 Foundation Tier Non-Calculator

### Unit Overview

Almost all candidates made a good attempt at answering most of the questions but the range in ability did result in varied responses, particularly for those questions that were challenging in the latter part of the paper. Candidates were able to access the full grading spectrum and where possible, appropriate marks were awarded for correct method and when minor arithmetical errors were made. The language used was accessible, though better reading of the question could have produced better marks. A lack of time was not really a consideration with almost all working through to the end of the paper and only weaker candidates not attempting the last few questions.

- Q1** This scale factor question was a nice starter and answered correctly by almost all.
- Q2** This one proved more challenging for weaker candidates with many not seeing that in (a)  $54 \times 100 = 5400$  and therefore the missing number would have to be 25 and in (b) that  $68 \times 100 = 6800$  and given that there were already 40 '68s', another 60 '68s' would be needed.
- Q3** There were a variety of numerical errors made in both parts of this question. In (a), working with 4500 instead of 45000, not being able to divide by 9 correctly and forgetting to multiply by the 2 were common. In (b), working with their answer in (a) rather than the 45000 and calculating just 10% or 1% incorrectly were other mistakes seen.
- Q4** A number of candidates clearly didn't read this question and tried dividing by 54 often incorrectly. Weaker candidates did not see the connection with the example given and errors were also made in the division by 6 and/or by 9.
- Q5** A common error made here was again a failure to read the question properly and calculate 10% of the 800 rather than that of their 15% answer. A few also did not answer the question asked on the number 'not in the Year 11'.
- Q6** This question was generally very well answered with a follow through mark awarded if there was an error in the first calculation.
- Q7** The table of outcomes was very well completed in (a) and the probability in Part (b) often correctly given. In (c) however, some candidates counted the 'green' twice and gave the incorrect answer of  $\frac{7}{10}$ . Equivalent correct answers such as 0.1 or  $\frac{3}{5}$  and 0.6 were of course allowed but ratios were not accepted.
- Q8** In (a) although the 'stages' were referenced in the introduction, a number gave 'time' answers rather than a correct 'letter' – if relatable they were still given the mark. Only the better candidates were able to calculate the average speed in (b) and complete the final stage of the journey in (c).
- Q9** In (a), a correctly drawn scale diagram anywhere on the page was given full marks but it was expected that candidates would begin at the point marked B. The weakest candidates did not use the given scale at all, and a few did not have the line CA drawn at right angles. In (b) those who had the correct diagram generally gained full marks but there were also a few who did not use the scale and rather used 'Pythagoras' thus gaining no marks.
- Q10** This question was a good differentiator. In (a) those who chose to calculate the amount of butter required for 4 scones then 20, often did better than those calculating for 1 scone and then 20. In (b), weaker candidates did appear to struggle with presenting their thinking and again their chosen method often determined their marks.



- Q11** The better candidates often gained full marks in this question. Mistakes made in (a) included moving either 7 left and 6 down and in (b), rotating about the wrong point or rotating clockwise and trying to persevere even though they could see the shape did not fit the grid.
- Q12** Weaker candidates often had difficulty in finding the total of the probabilities given with the 0.2 on quite a few occasions being treated as 0.02. It should be noted that the first mark was awarded only when evidence of their total was being subtracted from 1.
- Q13** Many candidates at this level have difficulty with solving inequalities and this one was no exception. Those who treat it as an equation to begin, need to remember to return the inequality sign to their final answer. Those who got the correct answer in (a) were more than often able to show it on the number line in (b) but only the better candidates were able to score well in this question.
- Q14** Only the best candidates scored full marks on this question. Many attempts to draw the line  $y = 10 - x$  correctly were poorly done, with many random lines passing through either (10,0) or (0,10) just because there was a 10 in the line equation. It was disappointing to see a few candidates not realising the significance of the intersection point having drawn the correct line.
- Q15** Relative frequency always proves to be a difficult topic at this level, but it was good to see a number of candidates picking up some marks here. The answer  $\frac{19}{50}$  was of course acceptable in Part (a), many struggled to get the correct answer of 27 in (b) and although many knew that the spinner was biased, they found it difficult to explain why in (c). The 'expected' correct answer in (d) was only achieved by the very best.

## Assessment Unit M62 Foundation Tier Calculator

### Unit Overview

Most candidates made a good attempt at answering the majority of questions with the overall performance in this paper being better than in the non-calculator paper. The questions towards the end of the paper, as expected, often proved more difficult for the weaker candidates with those testing greatest and least values, the  $-x^2$  graph, indices and exterior angle and number of sides producing the lowest scores. The questions on actual distance, probability, lock combination and money conversion proved the most accessible.

- Q1** This opening question was very well answered by many candidates, with only a few forgetting to include 'miles' as the unit for their answer. It should be noted that the letter 'm' is not acceptable for miles.
- Q2** Most answered Part (a) of the question well. A few failed to read the second line and just subtracted 185 from 452. Some others did not correctly find the half of 454 and a few subtracted 185 incorrectly from 227. It was very disappointing to see candidates use the wrong conversion from miles to kilometres in Part (b) even though it was given for this exam.
- Q3** This was a different type of 'sequence' question and did prove difficult for weaker candidates. A few again did not read the question and gave just the next number, a few extended the sequence without spotting the 'pattern' giving every term up to the 30<sup>th</sup> but making a numerical error in their addition along the way. A generous mark was given for sight of the correct 30<sup>th</sup> term.
- Q4** This probability question was generally well answered although there are always candidates who do not know when they should use words or fractions. It is expected that an answer of 0 be given in (b) rather than  $\frac{0}{7}$  and that ratios should never be used to express a probability.
- Q5** Both parts here were very well done, with the correct scale interpretation often given in (a) and the correct possible lock combinations given in (b).
- Q6** This conversion graph question had a slightly different starting point and for this reason proved difficult for weaker candidates. They were not supposed to randomly choose the 'wrong point' which some did and then draw a conversion graph through the other points. It was expected they would line up their ruler with (0, 0) and work from there. Those who did tended to score well in this question although there was still some misreading of the scale for part(c).
- Q7** Many gained the 2 marks in Part (a) with those extending to  $\frac{5}{60}$  picking up at least 1 mark. If the 2 marks were achieved in Part (a) then the mark available in (b) was generally awarded.
- Q8** This question was a good differentiator with weaker candidates appearing to struggle with presenting their thinking. Full marks could only be achieved by making a comparison between similar masses or a similar amount of money. Selecting an appropriate method proved difficult for many but marks were awarded for any positive work.
- Q9** A good attempt was made by most at this money conversion question with the main error being to divide by 1.06 rather than multiply. A few lost a mark in reading 37.1 as €37.01 rather than €37.10.
- Q10** This was a poorly done question with only the best gaining marks in either part. Perhaps this topic was omitted during revision.

- Q11** Most gained the first mark here for being able to calculate  $\frac{3}{5}$  of 180 but weaker candidates could not work with the 4:3 ratio properly, often just trying to calculate  $\frac{1}{4}$  and  $\frac{1}{3}$  of 280.
- Q12** Most knew that they had to find the total of the given angles and then subtract but were unsure of what to subtract from. There were however all sorts of variations suggested. The worst attempts were to just measure the angle from a diagram 'not drawn accurately'.
- Q13** A number gained a single mark for giving 45 as their final answer. Perhaps they didn't read the question properly and missed the 'not' written in bold or were lucky in gaining the mark for doing the correct something with 0.025 and 1800. Only the best got full marks here.
- Q14** Those who recognised the graph equation as a curve made a good attempt to draw one here and pick up some marks. There was the obvious difficulty in calculating 'y' for the negative  $x$  values – correct use of brackets in replacing the  $x$  value always helps weaker candidates – but they must remember to do it. Only the very best found the equation solution in Part (b).
- Q15** Indices always prove difficult at this level however, a number did get marks for having either the 4 or  $x^2$  in Part (a)(i) and quite a few got the  $x^{12}$  in Part (ii). It was good to see a lot getting the mark in (b) so near to the end of the paper.
- Q16** This was a challenging question for all with only the very best gaining full marks. A few tried to use the formula given for Part (a) and picked up a mark for finding the interior angle of 165 but in (b) they needed to do more than just divide 1800 by 180 to get anything.

## Assessment Unit M71 Higher Tier Non-Calculator

### Unit Overview

Overall, this paper was accessible to the vast majority of candidates. There were a few challenging questions to stretch the stronger candidates, but most candidates attempted every question.

- Q1** This question was poorly answered overall, being the first question on the paper. Many candidates did not read the information properly with common wrong answers of 108 (coming from  $120 - 12$ ) and 720 (coming from  $800 - 80$ ) seen.
- Q2** Most candidates gained the 2 marks here.
- Q3** (a) Most candidates gained 2 marks here.  
 (b) This was well answered by a majority of candidates.  
 (c) This part was more challenging and was not always answered correctly. A very common wrong answer was  $\frac{7}{10}$ .
- Q4** (a) Most candidates answered this correctly.  
 (b) This part was very poorly answered with only a minority of candidates getting the correct answer.  
 (c) This part was also very poorly answered with most candidates unable to work out the time it takes to travel 7 miles at 14mph.
- Q5** (a) Most candidates were able to do the scale drawing correctly for 3 marks.  
 (b) Most candidates were able to get the correct answer although some lost the mark for using Pythagoras' Theorem.
- Q6** (a) The more able candidates found this question straightforward. However, a sizeable number of candidates struggled with division without a calculator and only gained 1 out of 2 marks.  
 (b) This question really tested the candidates' understanding. There were a lot of correct answers but quite a few found the division without a calculator challenging.
- Q7** (a) Most candidates gained the mark here.  
 (b) A majority of candidates answered this correctly for 3 marks, but a few could not get the image in the correct position and as a result lost 2 marks.
- Q8** Most candidates got the right answer. However, a number of candidates made errors in adding up the given probabilities and as a result could only gain 1 mark if they showed that they were using the correct method.
- Q9** (a) This was poorly answered by a lot of candidates who struggled to solve the inequality due to poor algebraic manipulation skills.  
 (b) This part was often poorly answered. Some who had the correct answer in Part (a) drew their line to the right of  $-2$  rather than to the left.
- Q10** This was a challenging question for the weaker candidates. Many gained 1 of the 2 marks for a good attempt at drawing the second line but that was all they got. There were many poor attempts at drawing the straight line. Other candidates lost all 4 marks for solving the equations algebraically.

- Q11** Overall, this question was one of the most poorly answered on the paper. Candidates obviously struggle to understand the concept of relative frequency.
- In Part (a) a very common wrong answer was 0.19.
- In Part (b) many candidates struggled to calculate  $0.45 \times 60$  without a calculator.
- In Part (c) many candidates struggled to give a good enough reason.
- In Part (d) many candidates did not do the correct calculation. A common wrong answer was 100.
- Q12** Many candidates answered this correctly although most weaker candidates could not draw the line  $y = x$  and so got no marks.
- Q13** This was obviously a challenging question requiring the use of algebra which was out of reach for many weaker candidates. However, many candidates gained 2 marks for writing down the two initial equations. Some candidates made mistakes in attempting to solve these equations as the numbers involved were relatively large. Weaker candidates often resorted to some form of trial and error despite the question stating that this was unacceptable. There were a surprising number of correct answers seen.
- Q14** This was probably the hardest question on the paper and only the really top candidates gained the 2 marks here.

## Assessment Unit M72 Higher Tier Calculator

### Unit Overview

Overall, this paper seemed to offer candidates of all abilities the opportunity to score marks in most of the questions. There was enough variety in the questions to differentiate between candidates of differing abilities.

- Q1** This was a good opening question with a lot of correct answers seen. A number of candidates used a counting-up method but not always with success.
- Q2** This question was challenging and brought out a wide range of correct responses as candidates developed their own ways of comparing the tubs by weight or by price. Some candidates who could not develop a strategy found the question difficult.
- Q3** This question was well answered by many candidates and a large majority of them gained all 3 marks.
- Q4** This was quite a challenging question for many candidates with quite a few of them failing to get either part correct.
- Q5** The better able candidates scored full marks in this question, but many candidates only scored 1 out of the 4 marks available. In many cases this was due to a failure in reading the information in the question properly.
- Q6** The more able candidates found this question an easy source of 3 marks. However, quite a few candidates were let down by their inability to work out the sum of the interior angles in a pentagon as 540 degrees.
- Q7** The problem in this question for a number of candidates was not realising that it was testing mathematical expectation. This was due to interpreting the phrase 'work out an estimate' as meaning 'round each number'. This was often evidenced by seeing the calculation  $0.3 \times 2000 = 600$  and then  $2000 - 600$  giving an answer of 1400.
- Q8** (a) The standard of drawing the graph of a parabola was quite poor in this question. Many candidates failed to complete the values in the table correctly, especially for negative values of  $x$ . There were many mistakes made in plotting the points correctly even from candidates who had the table of values correct.
- (b) Many candidates were unable to use the graph to solve the given quadratic equation. Even some of the better candidates resorted to using algebra to solve for  $x$  rather than using the graph and got no marks.
- Q9** (a) Poor manipulation skills using index numbers let down quite a few candidates in this part of the question.
- (b) Although half of the answer was given, that did not prevent many candidates being unable to complete the  $n^{\text{th}}$  term of the sequence.
- Q10** (a) Many candidates seem unaware that the sum of the exterior angles of a polygon is 360 degrees leading to many candidates scoring no marks in this part of the question.
- (b) This part of the question was poorly answered by nearly half the candidates which was disappointing given that the formula for the sum of all the angles inside a polygon was provided in the sheet of 'Additional Support Materials'.
- Q11** Only the more able candidates could carry out this enlargement correctly. Some candidates seemed unaware that a scale factor of  $\frac{1}{3}$  would lead to a smaller image diagram.

- Q12** The vast majority of candidates were unable to do this question correctly. Most assumed that the volume would be four times as large resulting in the answer 1200 very commonly seen.
- Q13** More than half the candidates were able to work out the answer to this question correctly, although a few resorted to listing all 20 choices.
- Q14 (a)** Only the more able candidates knew that they had to multiply the probabilities. A lot of candidates simply added the probabilities with the answer 0.2 frequently seen.
- (b)** Many candidates answered this part of the question correctly, giving their answer as a decimal, a percentage, or a fraction.
- Q15 (a)** This was probably the most difficult question on the paper, with only the most capable candidates getting the correct equation. Some candidates worked out the value of  $k$  correctly as 120 but lost the final mark for failing to express  $T$  in terms of  $d$  as requested in the question.
- (b)** With so few candidates getting the correct equation in Part (a) it meant that there were very few correct answers seen in Part (b). Even some candidates who get the correct equation in Part (a) were unable to use it in Part (b) to solve for  $d$ .

## Assessment Unit M81 Higher Tier Non-Calculator

### Unit Overview

In general the candidates performed well with many showing a good understanding of the topics examined. As the paper progressed the level of difficulty increased sufficiently to allow candidates of different abilities to be identified. By the final questions only the best candidates were able to demonstrate the highest level of achievement for this specification. Most candidates were able to attempt the majority of the questions, having clearly had an introduction to topics right across the syllabus.

- Q1 (a)** This was well answered by the majority of candidates. Some solved the equality and forgot to return to an inequality.
- (b)** This part was correctly answered by most of those answering (a) correctly.
- Q2** A majority of the candidates were able to deal with the first three parts of this relative frequency question, but only the better candidates interpreted the final part correctly.
- Q3** This was a challenging question for a quarter of the candidates, who scored no marks at all but over 60% answered the question completely correctly.
- Q4** The majority of candidates answered this correctly although weaker candidates having drawn the line  $y = x$  could not reflect the shape completely accurately in it.
- Q5** The majority of candidates could write down the relevant simultaneous equations and a significant minority could solve them for full marks, but nearly a quarter of the candidates were unable to introduce algebraic equations at all.
- Q6** About a third of the candidates gained the 2 marks here, while less than a third made some meaningful interpretation of standard form.
- Q7** A sizeable minority of the entry successfully changed the recurring decimal into a fraction and about a fifth made a partial attempt to do so.
- Q8** Most of the candidates drew the tree diagram correctly and over half of these used it correctly to answer Part (b).
- Q9** An encouraging majority of the candidates found the radius of the given circle in surd form, but only the better candidates were able to work out the equation of the tangent and only the best could then find the parallel tangent. A sketch would have proved a useful aid.
- Q10** Only 5% of the candidates realised the complexity of rolling the dice three times and three quarters gained no marks in this question.
- Q11** This proved the hardest question on the paper with very few candidates gaining full marks. A reasonable number gained some marks for some correct manipulation of indices such as  $(2^a)^3 = 2^{3a}$
- Q12** Nearly a quarter of the candidates gained the 5 marks here, demonstrating confident manipulation of surd expressions. Many others scored some marks for making a sensible start to the question, using Pythagoras and some trigonometry.



## Assessment Unit M82 Higher Tier Calculator

### Unit Overview

As for the non-calculator paper, the candidates performed well with many showing a good understanding of the topics examined. Again, as the paper progressed the level of difficulty increased sufficiently to allow the better candidates to demonstrate their wider understanding of the more demanding elements of the specification content. There was no evidence that candidates did not have sufficient time to tackle all the questions on the paper.

- Q1 (a)** A large majority of the candidates gained both marks on index manipulation in the first part and about half of these gained both marks in the slightly harder second part.
- (b)** Over three quarters were able to complete the  $n^{\text{th}}$  term of the sequence.
- Q2 (a)** The standard of drawing the graph of a parabola was good for most of the candidates with very few scoring no marks in this section.
- (b)** Less than half the candidates were able, however, to use the graph to solve the given quadratic equation. Even some of the better candidates resorted to using algebra to solve for  $x$  rather than using the graph and did not gain the mark.
- Q3 (a)** About three tenths of the candidates seemed unaware that the sum of the exterior angles of a polygon is 360 degrees leading to them scoring no marks in this part of the question, but nearly half gained both marks in this part.
- (b)** This part of the question was poorly answered by half the candidates which was disappointing given that the formula for the sum of all the angles inside a polygon was provided in the sheet of 'Additional Support Materials'.
- Q4** Over half the candidates carried out this enlargement correctly. Some candidates seemed unaware that a scale factor of  $\frac{1}{3}$  would lead to a smaller image diagram, while others did not appreciate the meaning of the centre of enlargement.
- Q5** The vast majority of candidates were unable to do this question correctly. Most assumed that the volume would be four times as large resulting in the answer 1200 very commonly seen.
- Q6** Three quarters of the candidates were able to work out the answer to this question correctly, although quite a few made simple counting errors.
- Q7 (a)** More than half the candidates knew that they had to multiply the probabilities, while many candidates simply added the probabilities with the answer 0.2 frequently seen.
- (b)** Three quarters of the candidates answered this part of the question correctly.
- Q8 (a)** More than half the candidates scored zero for the first part of this question, with many incorrect interpretations of the meaning of 'varies as the square'. About 30% scored full marks.
- (b)** More candidates scored full marks in Part (b) as some now presented correct solutions to their own equally difficult interpretations in (a).
- Q9 (a)** Nearly all the candidates selected the correct formula in this part.
- (b)** Just over a sixth of the candidates gained both marks here but most candidates calculated the value and forgot to calculate the interest, as requested.

- Q10** This proved the most difficult question on the paper. More than half scored no marks. Others made attempts to use the sine and cosine rules for some of the triangles with varying success. Only a very small number gained full marks, including fewer who noticed that in the first triangle the sum of two of the sides was smaller than the third.
- Q11** (a) More than half the candidates drew a good graph of the exponential equation for share values.
- (b) Nearly as many knew the initial value of one share, but only a third could describe fully what the equation meant.
- (c) One tenth of the candidates gained both marks here but most others did not realise that a tangent was needed to find the rate of increase.
- Q12** Very few scored full marks in this 3D trigonometry question, but many gained some marks for marking the correct angle and calculating some relevant sides correctly.

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