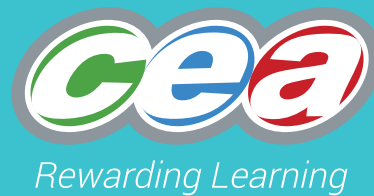


GCSE



Chief Examiner's Report Mathematics

November Series 2023



Foreword

This booklet outlines the performance of candidates in all aspects of this specification for the November 2023 series.

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

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

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GCSE MATHEMATICS

Chief Examiner's Report

Subject Overview

The overall impression about this series of examinations in Mathematics is that candidates had prepared well and had been prepared well for sitting the November papers. In most cases candidates found the papers accessible and were successful in demonstrating the skills, knowledge and understanding that they had gained in the subject, although it was clear in a minority of cases that some candidates would have been much better served by attempting a different paper, as this examination experience must have proved rather negative and discouraging. In a majority of the papers the mean score increased in comparison to last November and performances are moving well in the direction of pre-Covid standards. The papers again proved a good test for the candidates at all levels of entry with an acceptable incline of difficulty which allowed nearly all to make meaningful attempts at questions from first to last, while providing opportunities for the better able to distinguish themselves and gain the appropriate higher grades. The standard of answering was in general encouraging, with some outstanding performances on each paper.

Assessment Unit M1 Foundation Tier

Unit Overview

In general candidates found this to be a challenging paper. Marks ranged from single figure scores to a minority of stronger candidates scoring in the 70s and 80s. The paper provided opportunity for candidates of differing abilities to respond positively to the questions posed. It was pleasing to see most candidates showing their working out and as a result part marks were awarded in many cases for correct method even if the final answer was not reached. The paper offered candidates many opportunities to display their mathematical knowledge in a variety of contexts. A small minority of candidates left questions blank, particularly towards the end of the paper but most candidates persevered and attempted all the questions. There was no evidence that candidates faced time constraints.

As in previous recent series the standard of handwriting on a minority of scripts was poor and some candidates did not have access to the mathematical equipment required, including in some cases a calculator.

Q1 In Part (a) a minority of candidates recognised the shape drawn as a parallelogram, and generous marks were awarded frequently for poorly attempted spellings of the word. Candidates who answered quadrilateral were also awarded a mark. The most common incorrect response given was trapezium. Many candidates, in Part (b), answered within the accepted range for the length of side AD. Some candidates did not have access to a ruler however and could not provide an answer within tolerance. It was disappointing to note that most candidates in Part (c) were unable to recognise angle ABC as acute with obtuse frequently given as an answer. Other candidates used a protractor and wrote down the size of their measured angle and lost the mark. In Part (d) candidates generally made a good attempt at filling in the blank with the word parallel, showing understanding of the pairs of arrows on the opposite sides of the shape. Misspellings were the norm but were not penalised. Common incorrect responses included 'equal', 'identical' or 'similar'.

- Q2** This question was generally well answered by candidates with many awarded at least 2 out of the 3 available marks. Candidates who multiplied 2.4m by 4, or repeatedly added, to get 9.6 gained the first mark. Despite this being a calculator paper a number of candidates performed these calculations manually. Many candidates then correctly subtracted this from 10m and gained a second mark for 0.4m. The final mark was available for candidates correctly converting 0.4m to 40cm, which better candidates were able to do. The most common incorrect answer was 0.4, which gained 2 marks, the final mark being lost as no conversion of units was attempted. A minority of candidates had difficulty converting 0.4m to centimetres and answers such as 4 and 400 were seen. Weaker candidates frequently made arithmetical errors when multiplying 2.4 by 4 or when subtracting 9.6 from 10, often producing 4. Other candidates misinterpreted the information given and simply subtracted one length of wood from 10m to give an answer of 7.6m, or subtracted 2.4 from 10 repeatedly, frequently making arithmetical errors.
- Q3** It was pleasing to see many candidates scoring the full 3 marks for scaling and drawing a bar chart accurately. Candidates who scaled the vertical axis in twos often failed to draw their bars accurately at 7 and 19 and lost a mark. Candidates who scaled the axis in fives were mostly awarded all 3 marks, but their bar chart only covered a fraction of the grid, which shows incomplete understanding of this topic. Others scaled in tens and often lost marks for inaccurate plots at 7 and 19. A small number of candidates scaled in threes, but their bars were then inaccurately drawn. A significant number of candidates did not mark a scale on their chart, but 2 marks were still available if the bars were drawn to the correct heights. A few candidates marked the vertical axis at regular intervals with the 4 frequencies given in the table, 4, 7, 16 and 19, showing a lack of understanding of scaling.
- Q4** This question proved accessible to all candidates and 3 marks being awarded was the norm. In Part (a) most candidates identified Feet First as having the lowest total cost for the trainers. In Part (b) only a handful of candidates were unable to provide Run Fast and Sole City as having the same total cost. The most common incorrect response was Run Fast and Feet First, which both had the same price but different delivery charges. In Part (c) practically all candidates mentioned ‘next day delivery’ in their answers and were awarded the mark.
- Q5** In Part (a), knowledge of square numbers, multiples and factors was tested, and most candidates earned some of the 3 available marks, with stronger candidates frequently gaining all 3. Some candidates provided the two-digit number rather than the single-digit response required and were penalised. Candidates, in some cases, scoring 2 of the 3 marks may have thought the same digit, ‘5’, could not be used twice in their answers and on some scripts the third box had ‘5’ crossed out and replaced incorrectly. The second box, the multiple of 13 in the thirties, was the best answered of the three boxes. Lack of understanding of square numbers and factors was common amongst weaker candidates. Part (b), identifying the place value of the digit 1 as ‘millions’ was understood by many in the cohort. A common incorrect response was ‘ten millions’.

- Q6** Many candidates scored the first 2 marks for dividing the 670 miles driven by 5, the number of miles one unit of electricity provided charge for, and finding that 134 units were used. The third mark was also frequently awarded to candidates for multiplying the units used by 26.5p, the price per unit of electricity. However, only better candidates managed to correctly change their 3551p into £35.51 to earn the final mark. Most candidates who approached the problem logically did make good progress and picked up marks for their method. A minority of candidates failed to show understanding of the information presented or what the question was asking, often multiplying instead of dividing and vice versa. A common incorrect approach was to multiply 670 by 5 instead of dividing, then multiply this by 26.5, leading to £88775. It would be expected that candidates would realise this is an inappropriate monthly cost for charging an electric car.
- Q7** Identifying the diagrams with shading equivalent to $\frac{1}{3}$ proved problematic to all but the very best candidates. Many candidates circled the net of a cylinder, probably because one of its three components was shaded, showing no appreciation that the components were different sizes. Few candidates wrote down the fractions shown on the diagrams, and those that did often failed to attempt to simplify them or struggled to simplify them correctly. A lot of candidates were, however, awarded 1 mark for circling at least one of the two correct diagrams as long as they had no more than one extra diagram indicated. Overall, it is disappointing that many candidates sitting this paper were unable to demonstrate understanding of this basic skill.
- Q8** This question on coordinates was accessible to the majority of candidates who had no problem identifying the coordinates of A as (0, 1) in Part (a). A small minority of candidates answered (1, 0) and a few attempted to give the position of letter A on the grid rather than its point marked X, answering with (0.3, 1.3) or similar. Most candidates were successful in Part (b) and realised the continuing line would pass through (10, 6).
- Q9** Whilst there were a few correct responses most candidates were unable to draw the required quadrilateral with an area of 6cm^2 . A significant minority of candidates were generously allowed 1 mark for drawing a shape with an area of 6cm^2 which was not a quadrilateral and the most commonly seen were 'L' shapes, 3 by 4 triangles and 3 by 2 rectangles. It seemed as if many candidates were unaware that they could use half squares on the grid in their answer. The most commonly seen incorrect responses were rectangles with areas of 8 or 12cm^2 . This question demonstrated a lack of knowledge and awareness in types of quadrilaterals as most candidates who failed to produce a correct trapezium answered with rectangles.
- Q10** Understanding of area and volume was tested in this question. In Part (a) candidates were asked to find the area of the carton's front face and better candidates were able to identify the correct dimensions, 6cm and 15cm, multiply them and give an answer of 90 for 1 mark. A minority of candidates answered 42, the perimeter of the face, while others added rather than multiplied the dimensions to get 21. A small number of candidates found the volume of the carton in Part (a) and no marks could be awarded. In Part (b) candidates were required to find the volume of the carton and many candidates did so successfully for the award of 2 marks. For those with an incorrect area in Part (a) follow through marks were allowed for candidates multiplying their 'area' by 6. Candidates who were correct in Part (a) were also frequently correct with their volume here. A couple of candidates who had answered 540 in Part (a) answered 90 here and no marks could be awarded. In Part (c) 1 mark was available for explaining that the carton holds more than half a litre of juice. Most candidates, including those who had the correct volume of 540cm^3 , failed to reference half a litre being 500ml (or cm^3) and lost the mark.

- Q11** It was pleasing to see so many correct responses, and across the full ability range, to this question testing candidates' understanding of the mean. Many candidates correctly summed the 8 values to 192 and divided by 8 to find the mean number of meals served per night as 24. A minority of candidates who understood the method required to calculate the mean made arithmetical errors when summing the values or carelessly omitted a value, but most did gain method marks, if they showed their working out. A number of candidates confused mean and median and gained no marks. In Part (b) many candidates understood that if 23 meals were sold the following night the mean would decrease. Incorrect means given in Part (a) were followed here for the available mark.
- Q12** Part (a), writing down the fraction of spending on rent from the given pie chart was answered well by stronger candidates. The answer $\frac{120}{360}$ or its equivalent was seen frequently, but a lot of candidates failed to answer with a fraction and a common incorrect response was 120. A few candidates worked with $\frac{360}{120}$. Some candidates used 100 as their denominator rather than 360 and answered with $\frac{360}{120}$ or $\frac{3}{2}$. In Part (b)(i) just over half the candidates knew to divide the amount spent on bills by 2 to give £75 and gained the mark. Many candidates did not know how to tackle this question and a range of incorrect answers were given. Part (b)(ii), finding the total spent, was less successful and only the very best candidates earned the available mark for £900, or for multiplying their incorrect answer to Part (b)(i) by 12 correctly. The majority of candidates at this level failed to spot the connections which should have made finding the answer a straightforward process, either multiplying £150 by 6 or their '75' by 12. This question was a good discriminator by ability.
- Q13** Part (a), finding the new temperature after a fall of 3°C from -2°C, proved to be accessible to most of the cohort and correct answers were the norm. The most common errors were 1°C and -1°C. Part (b) saw many candidates gain either 1 or 2 marks for finding the least number of T-shirts Mike could have. Candidates dividing the total of 30 by 3 to get 10 were awarded 1 mark and for those who then went on to answer 11 two marks were awarded. A common incorrect method involved dividing 30 by 2, rather than by 3 and trying to progress from 15.
- Q14** Both parts of this question testing understanding of taking readings from a conversion graph were well answered in general and many candidates scored full marks. The scale was easy to read on both axes and any errors were generally due to careless interpretation of one or both scales. Incorrect readings resulted in Part (a) when candidates moved two small squares to the right of 12 (or to the left of 16) on the horizontal axis, while attempting to take a reading at 14. Some candidates who incorrectly answered Part (a) were successful in Part (b), perhaps suggesting that £150 on the vertical axis was easier to locate for weaker candidates than 14 hours on the horizontal axis.
- Q15** In Part (a) many candidates identified Paddy as being correct, recognising that $2.2^2 > 4.4$, though some candidates may have used their calculator to find the value of 2.2^2 to help them decide. Others may have guessed incorrectly or thought 2.2^2 meant doubling 2.2. In Part (b)(i) only a handful of candidates seemed familiar with the ' \neq ' symbol. Some candidates used the '<' symbol and gained the mark if they wrote out the statement as $3 + 2 \times 5 < 25$. It was clear that many candidates knew the answer to $3 + 2 \times 5$ was 13 but they didn't know how to write the statement as instructed. Common errors included writing the statement as $3 + 2 \times 5 = 13$, writing 'does not equal' in words or adding an 'X' to the end of the statement. Others put an 'X' through the 25 or above it. Part (b)(ii) was much more successful and most candidates provided 13, the correct answer.

- Q16** A significant number of candidates in Part (a) found 6% of £18000 as £1080, but failed to divide by 12 to find the monthly rise, and were awarded 2 of the 3 available marks. Many candidates, however, did correctly find the monthly pay rise as £90 but added it on to the monthly pay of £1500 on the answer line and lost a mark. Some candidates lost sight of what they were doing and added the £1080 they found on to £18000 and answered £19080. Common errors, particularly with weaker candidates, included finding 60% rather than 6% of £18000. It was pleasing to see detailed working out on the majority of scripts. This part of the question proved to be a good discriminator of ability with marks distributed from 0 to 3 reasonably uniformly. In Part (b) candidates had to find $\frac{2}{9}$ of £360, which was the monthly increase in Zara's rent. Candidates found dealing with a fraction of an amount in this part of the question more challenging than dealing with a percentage of an amount in Part (a), but better candidates were frequently successful. As only one mark was available some candidates needlessly lost it when they added the £80 increase to £360, or in a few cases subtracted it.
- Q17** In Part (a) the majority of candidates had no problem reading information from the train timetable and a significant majority of the cohort answered 15:36 correctly, the time the 13:45 train arrived in Blackpool North. Part (b), however, proved extremely challenging for all but the very best candidates. Candidates struggled in general to calculate the time difference between 13:45 and 15:36. A common incorrect response was 191 minutes leading to 3 hours 11 minutes (or 1 hour 91 minutes), coming from using a calculator to subtract 1345 from 1536. No marks were awarded for this incorrect method. For candidates attempting to work up from 13:45 to 15:36 the available method mark was only awarded for genuine attempts, often limiting the mark to sight of 15 minutes, 1 hour and 36 minutes. A common incorrect response for candidates who tried to deal with the time calculation using non-calculator methods was 2 hours 51 minutes.
- Q18** This question, in Part (a), tested knowledge of angle theory, and a small minority of candidates showed good understanding by working methodically to produce the expected response, 81° . Some candidates were awarded a mark for finding 40° , the unknown base angle, but could not progress further. A common error was to assume the triangle was isosceles, leading to an answer of 62° , which gained no marks. A sizeable number of candidates added 59 and 140, then subtracted 199 from 360, answering 161° . Others subtracted 180 from 199 leading to answers of 19° . It was clear that a number of candidates used a protractor to measure the angle, despite the 'diagram not drawn accurately' advice shown. In Part (b) most candidates were unable to calculate the area of the triangle and even the standalone units mark was rarely awarded. The majority of candidates multiplied the base, 9 m, by the perpendicular height, 5 m and answered 45 or 45 m. A small minority of candidates did correctly calculate the area as 22.5 and gained 2 marks, but lost the last mark for omitting or supplying incorrect units. A number of candidates gave cm^2 units which carelessly cost them a mark they were clearly capable of.

- Q19** Parts (a) and (b) of this stem and leaf diagram question proved to be a mixed bag, with many correct answers seen for the median in Part (a) and the range in Part (b), although a sizeable number of candidates only managed to find one or the other correctly, rarely both. Some candidates ignored the key and answered 263 and 56 instead of 26.3 and 5.6, but were not penalised twice for their repeated error. A small number of candidates, who knew how to find the median, miscounted and lost the mark, often answering 26.5. Careful checking of work should be encouraged. In Part (c)(i) and Part (c)(ii) better candidates understood what was required and compared the two distributions correctly, stating True in the first part and False in the second. However, it was evident that some candidates just guessed, while others left the answer spaces blank. One of the more common incorrect responses was to list True and False in the wrong order which may suggest candidates were confused by what the data was representing, perhaps thinking a greater time meant ‘faster’ and ‘more consistent’. Some candidates answered with ‘Yes’ and ‘No’ rather than ‘True’ and ‘False’ but were not penalised.
- Q20** In Part (a) most candidates managed to gain either 1 or both of the available marks for finding the total value of the notes in the till as £260. A few arithmetical errors were seen but 1 mark was available to candidates for correctly totalling their values if they had no more than one error. Some candidates produced £260 but then answered with £85 or £25, the sum of the ‘Type of note’ column or ‘Number of notes’ column. One mark was generously allowed if 260 was seen. Part (b) was disappointing and even the strongest candidates were unable to find the mean value of the notes in the till. Instead of dividing £260, the total value, by 25, the total number of notes, to find £10.40, most candidates divided by 4, the number of different types of note, leading to answers of £65. Finding a mean from a frequency table should have allowed for differentiation by ability but apart from a handful of candidates gaining the available mark everyone else scored no marks.
- Q21** Candidates were given a list of 7 numbers and had to select a cube, prime, multiple of 12, power of 2 and the two numbers having a product of 375 from the list. Only a few candidates managed to score all 5 of the available marks, with most who attempted the question gaining no more than 1 or 2 marks. Surprisingly a minority of candidates left some or even all parts blank. The most successful part of the question saw candidates identify the multiple of 12 as 36. However, some candidates may have confused multiple and factor, giving 6 as their answer to this part. Candidates struggled in general throughout the question and $\frac{2}{3}$ could not find the ‘power of 2’, which was often answered as 6, rather than 16. Other common incorrect answers for this part were 25 and 36, candidates possibly thinking 5^2 and 6^2 were powers of 2, rather than powers of 5 and 6. Only about 30% of the cohort identified 27 as a cube in Part (a) and a similar percentage answered 29 correctly as the prime in Part (b). It was clear that a number of candidates did not understand the term ‘product’. There was little evidence to suggest candidates used their calculator to help find or test their answers.

- Q22** This question, dealing with filling small bags of rice from a larger bag, proved a good discriminator of ability, with better candidates picking up most of the 4 available marks across the two parts. In Part (a), 5 kg of rice is poured into 360 g bags and candidates had to calculate how many bags could be completely filled. Candidates who divided 5000 by 360 to produce 13.888 ... gained 1 mark and if they then rounded this down to 13 they gained a second mark. Frequently, candidates rounded their value up to 14, losing sight of, or failing to understand, the context. Some candidates left their answer as 13.8 or 13.9. A few candidates converted 5 kg incorrectly to 500 g. Weaker candidates commonly answered 72, which came from dividing 360 by 5. In Part (b), many candidates failed to understand what was being asked and did not address the question. Many candidates attempted to double the decimal, 13.8, from Part (a) rather than use the rounded whole number value for comparison. A common incorrect approach saw candidates divide 10000 by 360 to get 27.777 ..., then compare this with 2 lots of 13.888 ..., missing the point that 27.777 ... is enough for 27 bags, which is not exactly two times 13. Another approach seen frequently was candidates who divided 10 by 2 to get 5 (or 10000 by 2 to get 5000) and state, 'yes, it's exactly double'. A small number of candidates did however give clear and reasoned correct answers. It was pleasing to see many candidates showing their methods clearly throughout both parts of the question.
- Q23** In Part (a) candidates were asked to calculate $\sqrt{4^3}$ and many did so successfully, producing 8 routinely. Part (b) proved to be more challenging, candidates being asked to calculate $\frac{3(2.6^2-1.3)}{5.7}$ and give their answer to 1 decimal place. Better candidates were able to use their calculator to find 2.873 ... and were awarded 1 mark, with many going on to answer correctly with 2.9 for a further mark. Some candidates who used their calculator correctly rounded to 2.8, or in some cases 3 or even 3.8, losing the final mark. A few candidates who may not have had a calculator attempted to multiply and divide manually but made little progress.
- Q24** Candidates had to find the start time for a journey when a lorry was to be driven 156 miles at an average speed of 48 mph and had to arrive at 4 pm. Three marks were available for an answer of 1245 but many failed to gain the final mark even though they calculated the time for the journey correctly as 3.25 hours. Two marks were awarded to many candidates for 3.25, but this was often taken to mean 3 hours and 25 minutes rather than 3 hours 15 minutes. Common incorrect answers of 1235 then followed frequently. Better candidates were able to deal with the 0.25 hours correctly and gained the final mark. Some candidates were awarded no marks as they were unable to start the problem appropriately, with methods showing 156 being divided by 4 or 48 being multiplied by 4.

- Q25** This question tested understanding of surveys and data collection methods. A number of candidates left all three parts blank, possibly because they were asked for written explanations in the first two parts, though surprisingly they also left Part (c) blank too, which they could have guessed as either ‘qualitative’ or ‘quantitative’. In Part (a) candidates often misinterpreted the question and failed to describe a possible problem with Harry’s method of collecting data, answering with statements such as, ‘all cars are different’, ‘no-one knows how many miles they travel’, ‘people may not know how much they spent’, ‘people might lie’, ‘the cost of fuel changes all the time’, ‘they might not understand what Harry wants’ or ‘there is no timeframe’ etc. A minority of candidates did comment appropriately on Harry’s method and understood that not all recipients of the survey drive or that some surveys might not be returned. Part (b) was much more successfully answered with many candidates realising that surveying 10 people is too small a sample for any conclusions to be valid. A minority of candidates referred again to perceived issues with what Harry wanted to investigate and were not awarded the mark. Part (c) seemed to be understood by many in the cohort as the majority of candidates responding described Harry’s data correctly as quantitative, rather than as qualitative. Inevitably, some candidates will have guessed fortuitously, but this would presumably be balanced by others guessing incorrectly.
- Q26** In Part (a), the greatest number of times someone checked their phone was frequently misread from the scatter graph as 155 or 156, rather than 154. Candidates who took care with the scale generally were correct and gained the mark. Part (b) proved slightly less accessible than Part (a) with fewer candidates able to read off 55 as the number of times the person aged 49 checked their phone. Common incorrect responses included 54 and 56. Part (c) was very well answered by a significant majority of the cohort as candidates were able to apply common sense and their own understanding to the question, with most able to explain that younger people checked their phones more often than older people. Many, clearly, would not have needed to use the scatter graph to draw this conclusion!
- Q27** This question and the next, testing algebra, were both poorly answered by the majority of candidates who do struggle with the more abstract mathematical concepts at this level. In Part (a) a small minority of candidates were awarded 2 marks for correctly simplifying the expression to $-2x + 6y$. Some gained 1 mark for finding one of the terms correctly, and dealing with it appropriately, mostly from adding the $6y$ to their incorrect ‘ $-2x$ ’. Incorrect answers seen occasionally included $12x + 6y$ and $-2x 6y$. Factorising $5k + 15$ in Part (b) was only answered correctly by a few of the strongest candidates, with many showing no awareness or understanding of how to factorise. A couple of candidates were generously allowed the mark for $5(1k + 3)$ given as their answer.
- Q28** A small minority of candidates, in part (a), formed the correct expression, $x + 2$, but the majority of candidates did not understand what was required and left the answer space blank or provided answers that bore no resemblance to what was expected. Part (b) was even more poorly understood, with most of the successful candidates from part (a) failing to multiply their expression by 3 correctly, with answers such as $3x + 2$ and $x + 2 \times 3$ appearing.

- Q29** This question proved to be another good discriminator by ability with strongest candidates gaining all three marks for finding 85% of Pete's wage was not for working overtime. Many candidates gained 1 mark for correctly taking the overtime wage of £72 from £480, his total wage, to find £408, but were then unable to progress further with the question. Other candidates worked out that £72 was 15% of £480 but failed to take this away from 100% and were allowed 2 marks. Weaker candidates were often unsure how to start solving the question and in a number of cases attempted to find $\frac{480}{72} \times 100$ or $\frac{408}{72} \times 100$.
- Q30** Only a small number of candidates showed sufficient method to earn both of the marks available for finding the value closest to $\frac{3}{5}$. Most candidates failed to compare like with like values and scored no marks. The most successful attempts involved changing all values to decimals or percentages and comparing, though some candidates answered 57%, rather than 0.62, despite having converted everything correctly and lost the final mark. A minority of candidates attempted to change the given values to fractions for comparison but were unable to bring $\frac{3}{5}$ and $\frac{13}{20}$ to a common denominator to compare with $\frac{57}{100}$ and $\frac{62}{100}$.
- Q31** The final question proved extremely difficult for candidates at this level with only a small minority earning any marks. There was a lot of reading involved for candidates and usually they were unable to get started. For those understanding what had to be done, some were awarded a mark for finding $\frac{2}{3}$ of the total marks as 110, though some assumed $\frac{2}{3}$ was equivalent to 0.6 or 0.66. Others gained a mark for correctly calculating 60% of 85 as 51, though a common mistake was to find 60% of 80 as 48, if candidates worked with Paper 2 rather than Paper 1. It was pleasing to see the majority of candidates attempting this final question and showing their working.

Assessment Unit M2 Foundation Tier

Unit Overview

Candidates were able to make a good attempt at this paper, with no sign that there was insufficient time given or that any questions caused confusion.

There was no need for any equipment other than a calculator, meaning that no candidates were disadvantaged by not having a ruler or protractor.

In general methods were clearly shown, allowing candidates to access some marks in questions where they did not get the correct answer.

- Q1** This question proved to be unexpectedly challenging. Many candidates were able to get a shape which had an area of 6cm^2 but was not a quadrilateral.
- Q2** Some candidates were unable to calculate the area in Part (a) but were able to find the volume correctly in Part (b). Many failed to secure the mark in Part (c) because they didn't make reference to the fact that half a litre was 500ml or 500cm^3 .
- Q3** In general candidates were able to correctly find the mean, with only a few using either an incorrect total or divisor. Most were able to recognise that the mean would decrease in Part (b).
- Q4** This question was different to normal in that it was based solely on reading a pie chart rather than drawing or completing it. It was disappointing that some candidates were unable to obtain a fraction at all in Part (a). Of those who did, attempts to simplify the fraction were generally correct, although not necessarily. Of those who got the correct answer in Part (b)(i), less than half went on to get the correct answer to Part (b)(ii) and a significant number did not get either correct.
- Q5** In Part (b) many candidates knew they needed to divide by 3 and got 10, but did not know what to do after this, with few getting the correct answer.
- Q6** The readings from the graph were straightforward and the majority of candidates got both correct. Some looked for difficulties that weren't there by using decimal values that were marginally different from the correct answers.
- Q7** Part (a) seemed to be a guessing game, with all the answers appearing regularly. This would indicate that candidates may not have had a working knowledge of either square numbers or inequality symbols. There were many interesting attempts at a 'not equal to' symbol in Part (b), with few correct. Mathematical symbols and their meaning may be a useful area of focus for teaching moving forward.
- Q8** A common misread in Part (a) was to assume the question wanted her new monthly pay, rather than the increase in pay. There were some who used an incorrect multiplier for 6%, but who did everything else correctly. Finding a fraction of an amount proved surprisingly difficult in Part (b), with less than half of candidates securing the mark.
- Q9** Working out intervals of time continues to be something that candidates struggle with. They must be taught that simply taking one time away from the other on a calculator does not work. That was the most common approach used, resulting in no marks for almost half the candidates.
- Q10** In Part (a) most were able to calculate the 40° angle, but some then used a total of 360° , possibly because there were 4 angles shown. Failure to divide by 2 was the most common error in Part (b), as well as incorrect or missing units.

- Q11** It was pleasing to note that the common problem of leaving out the decimal point did not arise often in this series. Candidates who took the readings correctly in Part (a) and Part (b) generally went on to get Part (c) correct.
- Q12** Some who got the £260 correct went on to do something extra in Part (a), but the vast majority got full marks. In Part (b) the usual problem of dividing by 4 was frustratingly common, as was incorrect money notation, resulting in few candidates getting the mean correct.
- Q13** Despite the fact that the word ‘product’ may have been expected to be the least well known, Part (d) was correct more often than Part (a) or Part (c).
- Q14** In Part (a) many candidates did the division correctly, but some either incorrectly rounded up to 14, or did not round at all. Those who didn’t round then had no chance of getting Part (b) correct. Those who did the rounding correctly in both parts generally got the question completely correct.
- Q15** Many candidates secured at least 1 mark in Part (a) for having 1 of the terms correct while some made no attempt to connect the terms in either Part (a) or Part (b), leaving them as 2 separate terms in each case. Part (c) was poorly done. It would be helpful if candidates could be reminded that the number 1 should not be used as a coefficient in algebraic notation.
- Q16** This question highlighted a lack of basic algebra skills. Only around half of candidates were able to form the expression in Part (a), while Part (b) was rarely correct. In Part (a) there was again evidence of candidates using 1 as a coefficient, while in Part (b) some candidates used a multiplication sign rather than using a coefficient. Both of these should be strongly discouraged as they are not correct algebraic notation.
- Q17** The positive aspect of this question was that the majority of candidates were able to work out that the journey would last 3.25 hours. However, many then took that as meaning 3 hours 25 minutes and got an incorrect time of 12.35pm. The correct answer was rarely seen.
- Q18** There was an interesting variety of answers to Part (a) as it quickly became apparent that some candidates took the posting of the survey to be online. A persistent feature of questions like this is candidates who rhyme off answers such as ‘may not know’, ‘may lie’ and ‘may not want to tell you’, none of which are relevant. Part (b) was better answered while Part (c) saw the highest success rate, which was pleasing to note as the meaning of these words has not been well known in the past.
- Q19** Reading of the graph was generally accurate. The main issue was failure to know the difference between the correlation and the relationship, with many candidates giving the same answer for Part (c) and Part (d). The word ‘outlier’ was rarely seen in Part (e), despite the fact that it is mentioned in the specification.
- Q20** This question was very poorly answered. Where clear working was shown, a small number of candidates were able to access some marks, despite making an error. Using 9 rather than -9 was the most common mistake, resulting in an answer of 2. Candidates who started by adding the 5y and 2y together rarely made any further progress.
- Q21** As is always the case with this type of question, 15% was the most common incorrect answer, when candidates failed to do the subtraction. A small number wrote a decimal answer when they forgot to multiply by 100. Some who did not know how to calculate the percentage were able to access the first mark for finding the £408.
- Q22** Few candidates got this question fully correct, mainly because they failed to start by finding the total mark. Of those who scored 1 mark, this was almost always for calculating that the Paper 1 score was 51 marks.

- Q23** Only 1 in 20 candidates got the correct answer in this question, with the vast majority completely failing to spot the right-angled triangle and realise that the question required use of Pythagoras' Theorem. Candidates need to be taught how to use this in context, realising that a rectangle will always contain right angles.
- Q24** It is evident that finding the area of a kite is not given the same attention as finding the areas of squares, rectangles or triangles, as only a small minority of candidates were able to find it. Most commonly candidates simply multiplied the given measurements together.
- Q25** Part (a) and Part (b) were answered really well, possibly because they involved reading values from the Venn diagram rather than completing the diagram from information given, as is often asked. Part (c) was more difficult and was less well done, with the majority of candidates unable to work out the number of people who took part in one sporting activity and had lunch.
- Q26** Despite being relatively straightforward, only around 10% of candidates were able to find the coordinates correctly. It may be that the inclusion of a negative number and the fact that one coordinate came out as a decimal may have caused confusion, but more likely that most simply did not know what to do.
- Q27** Part (a) was reasonably well done but, as is often the case with this type of question, only a very small number of candidates were able to find the cost per mile in Part (b).
- Q28** The most common error in Part (a) was to add the 30% and 5% together, then find 35% of the original amount, rather than 30% of the original amount and 5% of the reduced price. The fact that many candidates showed clear working allowed them to at least access the first method mark. In Part (b) the amount was generally correct, although it was then impossible to get the mark for comparing them, unless a valid attempt had been made in Part (a) that was different to what they did in Part (b).
- Q29** Part (a) was well done and mostly correct. Candidates who showed the prime factor decomposition of 24 were able to access the first mark in Part (b) even if they didn't get the answer correct. Despite being a fairly easy question, which could have been done by simply listing factors, almost half of candidates were unable to make any valid attempt and scored 0 marks.

Assessment Unit M3 Higher Tier

Unit Overview

The performance by candidates on this paper was generally very good, with some very strong performances and not that many scripts with extremely low scores. The majority of candidates appeared to have been entered at the correct level and should have had a positive experience in this module. Throughout the paper, there was opportunity for candidates to secure straightforward 1 or 2 mark responses without stretching their mathematical ability too much. For those who were answering very successfully from the outset, the last 5 questions still provided enough stretch and challenge and clearly identified the very best. Number and Geometry and Measures questions were most successfully answered, with the exception of calculations involving time. Even good candidates struggle to deal with time calculations being worked in 60ths. This was evidenced in both Question 1 Part (b) and Question 9. There was a weakness in standard Algebra techniques as witnessed in Question 8, Question 12 and Question 22. Data Handling was assessed in various formats and whilst most were recognised and well attempted, there was a gap in using the correct terminology as outlined in the Specification as evidenced in Question 10 Part (c), Question 11 Part (e) and Question 25. There was a positive response to multistep problems as displayed in the strong level of response to Question 14, Question 15 and Question 24 with Question 26 perhaps being the best discriminator question.

Numeracy skills were tested directly and indirectly (through data, geometry or algebra) in Questions 2, 4, 6, 12, 13, 14, 15, 16, 17, 18, 20, 21 and 26. Questions with a functional element were generally well answered – with the exception of dealing with time. The better candidates showed greater initiative in approaching a question set in an unfamiliar context as evidenced in Question 27 and Question 28. Weaker candidates simply avoided these questions.

Literacy and communication were a feature of Question 6 regarding filling the bags of rice, Question 10 on the survey, Question 11 on the scatter graph and Question 20 on the proportional change. Whilst there was a definite improvement in the level of responses to these questions, some candidates still find it difficult to articulate their reasoning clearly. Time management did not seem to be an issue with nearly all candidates answering right to the end of the paper.

- Q1** The opening question on time produced a mixed response. The majority of candidates had no problem identifying the time of arrival in Part (a). However, calculating the length of the journey proved more difficult with very many candidates struggling to find the difference in the two key times. Too many simply offered a decimal subtraction of $15:36 - 13:45$ with little cognisance of time being in 60ths.
- Q2** Calculation of the missing angle in the triangle in Part (a) was well responded to with very many gaining full marks. Finding the area of the triangle in Part (b) presented a more mixed response. It was strange to see many candidates attempt to apply $\frac{1}{2} ab \sin C$ at this level, since it is not a requirement on M3. Also, despite the question asking to include correct units, too many omitted units and several then recorded cm^2 rather than referencing dimensions given in metres in the question.

- Q3** Reading from the stem and leaf diagram allowed candidates to respond positively. Calculation of the range in Part (b) was perhaps better answered than the median in Part (a). Frequently the median was given incorrectly as 26.5 rather than 26.3. Occasionally candidates forgot to interpret the key correctly and omitted the decimal point in the values they recorded. The response to the True/False parts in Part (c) gave a mixed outcome and it was unclear if candidates really knew the comparisons they were making based on the statistical values or if it was just guesswork.
- Q4** This was probably the best answered question on the paper. The vast majority scored the 2 available marks. Some candidates possibly because of the data being presented in a table thought the question had asked for the mean and took their calculations too far.
- Q5** The assessment of language of number definitions produced a mixed and often confused response. Whilst very many secured the two marks with clear understanding, there were equal amounts who in Part (a) confused multiple with factor often recording 6 as the answer and in Part (b) confused power of 2 with 2 as the power and hence recorded square numbers of 16 or 25 or 36. As a result although this question was early in the paper and only carried 2 marks, it did differentiate well between candidates of differing abilities.
- Q6** Most candidates made a valid attempt at Part (a) by dividing 5000g by 360g with the best then knowing to round their answer down to record the number of complete bags. Others lost a mark by recording the decimal answer or by rounding up. The assessment objective in Part (b) was missed by many where they started to compare part bags with many concluding Yes. The most successful responses were from those who had correctly given 13 bags in Part (a) and so once they reached 27.777 in Part (b) they automatically knew that the statement referring to exactly double was incorrect. As a result, this question proved a good discriminator between candidates of varying abilities.
- Q7** There was a very good response to the algebra skills tested in this question. In Part (a) some struggled with the signs of the algebraic terms whilst in Part (c)(ii) weaker candidates were not confident in placing the positioning of the 1 in the bracket once the common factor of c had been extracted.
- Q8** In all parts of this question there was limited understanding of the term ‘expression’. Many candidates including some very strong candidates presented all parts with an equals sign. The simple expression in Part (a) was generally well answered, the correct algebraic notation in Part (b) gave a more limited response, whilst very few achieved the 2 marks in Part (c). The requirement to convert the £5 to pence to match the cost of each packet given in pence was overlooked by most.
- Q9** In general, most candidates were confident in adapting the compound formula for speed to calculate the time of the journey. However, the calculated value of 3.25 was often then interpreted as 3 hours 25 minutes and not $3\frac{1}{4}$ hours. Like Question 1 Part (b) calculations involving time are still proving problematic even for some very strong candidates.
- Q10** The responses to the survey gave a varied response. In Part (a) too many focused on the topic of the survey as opposed to the method of collecting the data, despite this being printed in bold. In Part (b) nearly all candidates understood that the sample size was too small. Describing the data as qualitative or quantitative appeared to be guesswork rather than sound knowledge. This was evident in multiple changes of mind in circling the correct answer. Like the term ‘outlier’ in Question 11, the specific vocabulary of quantitative and qualitative is referenced clearly within the specification but very many candidates were not familiar with these definitions.

- Q11** Responses to the scatter graph for the most part were very good. Part (a) and Part (b) were nearly always correct. There was some confusion in Part (c) and Part (d) in distinguishing between correlation and the relationship. In fact, some candidates gave the relationship in both parts. Completing Part (e) with the word outlier had a limited response, despite this being a key word highlighted in the specification delivery of scatter graphs. A huge number recorded the word anomaly, terminology not written within the specification.
- Q12** The solution of the equations was perhaps not as well answered as in previous series. The fractional equation in Part (a) often resulted in candidates recording the incorrect solution of 3 rather than the standard cross-multiplication approach being assessed. In Part (b) many were able to correctly rearrange the variables but struggled with the rearrangement of the numbers.
- Q13** Calculation of a percentage in this question was very strong with many securing full marks. However, despite the word ‘not’ being bold, a significant number of candidates still gave the percentage of his wage which was for overtime, concluding with 15%.
- Q14** The problem-solving aspect of this question was really successful in differentiating between candidates. A range of marks from 0 to 3 were able to be awarded. Many got 1 mark for correctly calculating the 60% of Paper 1. Finding $\frac{2}{3}$ of the total was often attempted but a significant number rounded to 0.66 rather than working with the exact fraction. This ultimately led to non-integer scores which did not make sense. Where the total was correct most proceeded to secure the final mark for calculating Paper 2. On the odd occasion a candidate mixed up the 60% on paper 1 with Paper 2 but follow through marking enabled them to finish on 2 of the 3 available marks.
- Q15** The multistep question involving the application of Pythagoras Theorem was well answered. Unfortunately, some simply stopped after calculation of the diagonal rather than progressing with the requirements of the question. For those who did continue and reached a value of 7.2 some then rounded down to 7 runs rather than rounding up to 8 runs. Again, this was despite the wording ‘at least’ being presented in bold. A small number of candidates failed to recognise the topic being assessed and so lost all available marks.
- Q16** What should have been the application of a standard formula for the area of a kite or the alternative approach of adding the area of two triangles proved problematic for very many. Too many candidates simply found the product of the two given figures concluding with an answer of 36.
- Q17** Interpreting the triple circle Venn diagram was generally well responded to with very many getting Part (a) and Part (b) correct. Identifying the correct parts of the circle which included just one sporting activity and lunch was more testing and only the best presented the correct total of 11 people leading to the correct final cost. Many included all intersecting parts rather than isolating the parts as requested by the question.
- Q18** A straightforward identification of the midpoint was not answered to the standard expected given that it is a standard M3 exam question. The application of the formula was executed well by the better candidates. Those not familiar with the formula attempted by sketching a grid and whilst they generally identified the x-coordinate correctly the y-coordinate was often recorded as either 5 or 6 rather than the midvalue. It was unusual to see the number of candidates who attempted to find a gradient rather than a midpoint.

- Q19** There was a mixed response to the questions assessing the real-life linear graph. In Part (a) nearly all were able to read the corresponding miles for £8.40. Calculating the cost per mile in Part (b) was only correctly answered by the very strong candidates. Too many simply divided a single Fare by the associated miles with no understanding of the original fixed charge. Comparing two fares with the associated mileage was presented on occasion but perhaps had one incorrect reading but method marks were awarded. Unfortunately, some who to this point had presented a good solution then failed to record the money notation correctly as either 80p or £0.80 with some simply recording 0.8 on the answer line.
- Q20** This question was most successful in distinguishing candidates understanding of percentages in a contextual problem. It was not enough to know how to simply calculate a percentage. The application in a real-life scenario stretched the candidature. The better candidates understood the repeated proportional change aspect being assessed in Part (a) and therefore were also successful in Part (b), justifying the two step-process was not the same as a 35% reduction. Weaker candidates who presented the complete 35% reduction in Part (a) often repeated this in Part (b) and concluded ‘Yes’ or simply wrote $30\% + 5\% = 35\%$ so ‘Yes’.
- Q21** The most basic approach of listing multiples proved more successful for candidates arriving at the correct LCM of 180 than those who used product of primes. Too many who used prime factor decomposition struggled to apply the relevant technique to decipher the LCM. Too many concluded with the HCF. The application of primes to determine HCF and LCM needs more focus, including an understanding of the how the numerical size of their answer should relate to the terminology of factor or multiple.
- Q22** Understanding that the area of the rectangle algebraically involved expanding two linear brackets to arrive at a quadratic was not well recognised. The correct expression was not often seen and too many simply finished with $x^2 + 10$.
- Q23** Calculation of pressure by applying the correct formula enabled very many to secure the 2 marks. There were some who presented pressure = force \times area and so lost all marks.
- Q24** The problem-solving question on the pizza area was generally well answered. Occasionally where the correct area formula was applied some gave the incorrect fractional area of the pizza eaten rather than what remained, whilst others for some reason worked with wrong fractional values such as quarters or fifths.
- Q25** Calculating the interquartile range from the set of raw data was only successfully answered by the very best. Most responses simply gave the range. Occasionally a candidate did seem to be able to locate the upper quartile but not the lower quartile.
- Q26** The multistep question involving reverse percentages clearly identified the very best candidates. Having identified that 45% represented the 36 people who chose vegetarian, most were able to proceed to find the total number of people as 80 and hence completing the question successfully to secure the full 5 marks. Weaker candidates were able to align that $45\% = 36$ but as is normally the case with reverse percentages they then struggled to revert back to the 100%. Some tried to find either 45% or 55% of 36 and were working with non-integer numbers of people which should have alerted them to an error. Many lesser able candidates simply worked with 30, 25 and 36 as the number of people selecting each option with no understanding of the percentage aspect of the question.

- Q27** Manipulating the algebraic fraction produced a mixed response. There were those who were very clear in their approach and had no problems showing how they reached the given solution. At the other extreme there were those who limited knowledge of how to approach this question. In some cases a cross-multiplication approach was used bringing the denominators up to the top line to arrive at a linear expression involving brackets with no common denominator and so no merit was given.
- Q28** Finding the correct equation of the fourth line proved problematic for many. The novel approach to assessing this should have allowed candidates to secure some part marks by identifying at least some of the drawn lines correctly but knowledge regarding gradients and crossing points appeared to be very limited. Recording an equation on the answer line often appeared to be a hybrid of 4's and 5's in the hope of arriving at the correct equation by default. It was highly unusual to see even a good candidate present clearly their identification of the 3 given lines, arriving at the final equation by a series of correct identifications.
- Q29** Estimating the median in Part (a) from the cumulative frequency graph was accessible to many. In Part (b) estimating the number who passed and hence scored more than 34 was also well answered for many. There were the usual mistakes in just reading at 34 and not subtracting to find the more than aspect and there was also some misinterpretations of the scales despite knowing how to approach the question.

Assessment Unit M4 Higher Tier

Unit Overview

The performance of candidates in this paper ranged from excellent to poor. In the papers I marked the marks ranged from 14 to 100, 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. Examiners felt that the first three quarters of the paper (up to and including Question 19) was handled well by the majority of candidates. Questions that stretched the more able candidates were Questions 12, Question 15 Part (a), Question 19 Part (a), Question 21, Question 22, Question 24, and Question 26. However, some of the early, easier questions did cause problems with even the stronger candidates. Topics such as area of a kite, midpoint of two sets of coordinates and finding the IQR from a list all could have been answered better.

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

- Question 15 Part (a) (calculating the IQR from a list of data).
- Question 19 (setting up a quadratic equation given the surface area of a cuboid).
- Question 21 (a reasoning question on Circle Theorems).
- Question 22 (factorising a quadratic with three variables involved).
- Question 20 (setting up and solving a quadratic equation using the area of a trapezium).
- Question 24 (interpreting a histogram and calculating an estimate for the median using a histogram).
- Question 26 (calculating the radius of a cone by comparing surface areas of a cone and a hemisphere).

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.

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

Q1 In this one mark question on correlation a lot of candidates described the relationship between the two variables rather than the correlation.

The only answer accepted here was ‘outlier’ as that is the only word used in the specification. This was poorly answered with the majority of candidates writing ‘anomaly’ and receiving zero marks.

Q2 This question on Pythagoras’ Theorem was answered very well in general. Candidates who lost marks in this question either stopped when 139.014 was found or gave 7 or 7.19 as the answer rather than 8. A small number of candidates added 110 and 85 to their answer of 139.014...thus coming up with an answer of 3 runs. Only a small number of candidates did not use Pythagoras’ Theorem.

Q3 This was a straightforward question on finding the area of a kite, however a lot of candidates did not know the formula required to do so. The most common incorrect answer was 36.

- Q4** The vast majority of candidates answered Part (a) and Part (b) correctly in this Venn Diagram question with three overlapping circles. Part (c) was answered quite well in general, however, some candidates lost both marks by multiplying £16 by a variety of incorrect values obtained from misinterpreting the Venn Diagram.
- Q5** In this question on finding the midpoint of a line given two coordinates there were a lot of candidates who did not know the formula/method required. Some candidates subtracted the coordinates instead of adding them, before halving their answer, while others found the gradient to be $\frac{3}{10}$ and then wrote (3, 10) as their answer.
- Q6** The vast majority of candidates were able to read the real-life graph correctly and obtain the one mark. The most common error was reading the vertical scale from £8.80 instead of £8.40 and obtaining an answer of 5.4

This part of the real-life graph question proved to be more challenging for candidates as some were unable to make two appropriate comparisons to calculate the cost per mile. Approximately half the candidates got full marks. The weaker candidates divided £8.40 by 5 to get £1.68 and this obtained zero marks. Some candidates lost a mark for incorrect money notation.

- Q7** The vast majority of candidates obtained full marks in this two-stage percentages question. Candidates who did not obtain full marks were still getting one mark for getting £360 initially. A small number of candidates found 65% of £1200 to get £780 and this was worth zero marks.

Generally, candidates who obtained full marks in Part (a) obtained full marks in Part (b) as well. Those who got a final answer of £780 in Part (a) and again in Part (b) were awarded one mark in Part (b) only.

- Q8** In this basic linear equation question a lot of candidates obtained full marks. The most common mistake was when candidates attempted to multiply by 3 first but forgot to multiply the -5 term and ending up with $x - 5 = 6$ so $x = 11$. This was awarded one mark, along with similar mistakes such as $x - 15 = 2$ so $x = 17$, therefore it was rare for candidates to obtain zero marks in this question.
- Q9** In this question on finding the LCM of two numbers the vast majority of candidates obtained 2 out of the 3 marks available for correctly writing each number as a product of their prime factors or even just by correctly drawing the factor diagrams. Some candidates used their calculators to find the product of prime factors and this is also allowed. The most common mistake after obtaining the first 2 marks was writing the HCF (12) rather than the LCM. A small number of candidates wrote the list of multiples and this method was also worth full marks.
- Q10** In general, this question on solving a quadratic equation to find the value of x in relation to a rectangle was answered well, with just over half the candidates obtaining full marks. A lot of candidates made the given equation equal to zero and then used factorisation or the quadratic formula correctly, however some candidates then wrote 4 and -11 as their answers, failing to recognise that a length cannot have a negative value and therefore lost a mark. Trial and improvement methods were also seen but these were only awarded marks if some algebraic rearrangement was seen initially. The weaker candidates tried to solve the LHS of the equation as if it was equal to zero already, ignoring the '54'.

- Q11** This question on adding two linear algebraic fractions was answered well in general. The majority of candidates knew to find a common denominator with 6 and 12 being most commonly used. There were very few arithmetic errors made in multiplying out the numerators and then adding, however, once a numerical error occurred candidates could only obtain the first mark for finding a common denominator correctly. The weaker candidates tried to let the sum of the two fractions equal the given single fraction and attempted to solve this an equation.
- Q12** Only 30% of candidates obtained full marks in this question on finding the equation of a fourth line given the equations of three other lines. The most capable candidates were able to write down the correct equation without any working out and obtained full marks. Candidates who ended up with an incorrect answer were able to gain marks for correctly labelling at least two of the three lines with the correct equation and/or having the correct gradient or y-intercept value in their final answer. Some candidates tried to calculate a perpendicular gradient instead of a parallel gradient.
- Q13** In this question on calculating pressure given a force and area the vast majority of candidates were able to obtain at least 2 out of the 3 marks available. Some candidates did not include units or included incorrect units with their correct value of 750. The only acceptable units were N/m² or Pa (Pascals). A small number of candidates tried to change the area to cm² initially, but this was always done incorrectly by saying 0.32m² equals 32cm²
- Q14** Approximately two-thirds of candidates gained full marks in this question on finding a fraction of an area of a circle/pizza. Only the stronger candidates used the most efficient method and calculated the correct answer in one line y finding $\frac{3}{2} \times \pi \times 5^2$. The most common method was to find the area of the circle, divide this by 6 and then multiply by 2 and finally subtract this from the full area of the circle. Only a very small number of candidates used the formula for the circumference instead of the formula for the area.
- Q15** In this question on calculating the IQR from a list of numbers only a small number of candidates got any marks – only 20% of the candidates got full marks. The vast majority of candidates did not know how to find the upper and lower quartiles. This part of the question on stating the most representative average and giving a reason for it was answered quite well with a lot of candidates knowing it was the median due to the extreme value. The weaker candidates wrote a number for their answer instead of ‘median’.
- Q16** The majority of candidates were able to read the median from the given cumulative frequency graph correctly, however, some candidates read from 40 on the x-axis and got 48 as their answer. In this question on estimating how many apprentices passed given the pass mark the majority of candidates got full marks. Some candidates just read up from 34 on the x-axis to get 36 but forgot to subtract this from 90 and therefore obtained one mark.
- Q17** Approximately half the candidates were able to explain why it is appropriate to take a stratified sample for the given data with the key word being ‘representative’. The weaker candidates continue to write accurate; fair; less time-consuming. The majority of candidates now know how to take a stratified sample and knew to round their answers correctly. Some candidates lost a mark for incorrect rounding or leaving their answers as decimals. The weaker candidates did not know how to start this question and just divided 100 by 4 and wrote 25 for each group.

- Q18** In this multi-stage trigonometry question most candidates were able to get the first two marks by finding the length of AB correctly. However, mistakes were then made in using this value in the second stage by using cos instead of tan. The most efficient way to calculate the length of BD is in the mark scheme, however, some pupils used other correct methods involving Pythagoras' Theorem or the Sine Rule. The vast majority of candidates gave their answers correct to 3 significant figures.
- Q19** This question on setting up a quadratic equation using the surface area of a cuboid was only answered correctly by the more able candidates – 36% of the candidates got full marks. The majority of candidates did not know how to start this question and usually just tried to solve the equation. Some candidates did not read the question properly and therefore tried to use 6 sides instead of 5. These candidates usually tried to 'fix' their answers as they couldn't see their mistake.
- Candidates who solved the quadratic equation in Part (a) and then used the positive answer in Part (b) were awarded full marks. The weaker candidates could not solve the quadratic equation and tried to leave their answer in terms of algebra and received zero marks.
- Q20** This question on using upper and lower bounds in a division was not answered well in general. A lot of candidates could get the upper and lower boundaries for 5.4cm but then struggled with finding them for 23.21cm^2 . Only a small number of candidates who found the correct minimum value went on to round their answer even though the question asked for all figures on calculator displays to be written down. This is to encourage candidates to give the full number in the future. The weaker candidates did not know how to start this question and just divided the two given values.
- Q21** In this circle theorems question involving calculations and reasoning only the strongest candidates were able to obtain full marks – 12% got full marks. Most candidates were able to obtain 2 marks for calculating $\text{PQR} = 68^\circ$ and $\text{POR} = 136^\circ$ without reasons provided. All other correct angles required correct reasons to gain the marks. The weaker candidates either left this question blank or used the AST incorrectly to start the question.
- Q22** Again, only the strongest candidates were able to answer this factorising a quadratic question correctly. However, a fair number of candidates could factorise the expression into two brackets, but their error was leaving 'a' in one of the brackets. Weaker candidates were able to gain one mark by taking the 'a' outside the bracket. Candidates are advised to start this question by taking the common letter outside a bracket first and then factorise the remaining expression after that.
- Q23** This is a common question on solving an equation involving algebraic fractions with 'x' terms in the denominator and leading to a quadratic equation. Again, the stronger candidates were able to obtain full marks in this question with the most common method used being the same as the one in the mark scheme. Candidates who started with a correct common denominator but then made mistakes in expanding brackets or tidying up their algebraic terms could get follow through marks for solving their quadratic equation if they had obtained at least 3 out of the first 5 marks. The vast majority of candidates were able to obtain the first 2 marks for starting with finding a common denominator, but then poor algebra skills meant they could not get any more marks. Only a very small number of candidates did not round their answers to 2 decimal places.

Q24 This question on interpreting a histogram was not answered well in general with only the strongest candidates obtaining full marks. Most candidates struggled to find a link between the area of the bar and the frequency. Candidates who gained one mark were able to find the correct scale for the frequency density axis but then could not deal with the fractional part of the last bar. The majority of candidates either left this question blank or produced working out of no value.

Only a small number of candidates (13%) were able to correctly calculate an estimation for the median weight from the histogram. A lot of candidates were able to gain one mark for identifying the correct group the median lay within (14 – 18kg) but could not proceed any further.

Q25 This question on simplifying an algebraic fraction was quite well answered in general with even some of the weaker candidates gaining full or part marks. Most candidates knew to factorise the numerator and denominator, but some made mistakes on either one and therefore could not gain any more marks. A small number of candidates factorised and cancelled correctly but then proceeded by cancelling the x^2 with the x in $x + 3$ incorrectly and in these cases they lost a mark. The weaker candidates did not know to factorise first and tried to cancel x terms in numerator and denominator.

Only a very small number of candidates (1.6%) obtained full marks in this question on finding a radius of a cone using surface areas of a cone and a hemisphere. A small number of candidates obtained one or two marks for using Pythagoras' Theorem initially or for the correct expression for the surface area of the hemisphere. The vast majority of candidates did not know how to start this question and could not gain any marks. Most candidates just wrote down formula for surface area of a sphere or left the question blank.

Q26 Only a very small number of candidates (1.6%) obtained full marks in this question on finding a radius of a cone using surface areas of a cone and a hemisphere. A small number of candidates obtained one or two marks for using Pythagoras' Theorem initially or for the correct expression for the surface area of the hemisphere. The vast majority of candidates did not know how to start this question and could not gain any marks. Most candidates just wrote down formula for surface area of a sphere or left the question blank.

Assessment Unit M5 Foundation Tier Non-Calculator

Unit Overview

This proved to be quite a challenging paper for many in the cohort. Marks ranged from single figure scores to strongest candidates scoring in the mid-40s out of 50. In common with previous series, this non-calculator paper demonstrated again that often candidates at this level struggle with their basic numeracy skills, including finding straightforward fractions and decimals of amounts. While pleasing to note that some candidates are showing good understanding of estimating skills, a significant proportion of the cohort are still poorly prepared to competently attempt these questions, with many rounding inappropriately or trying to work out exact answers. The standard of handwriting in some cases was very poor and answers were sometimes difficult to read, particularly when explanations were required and on some scripts the digits given on the answer line were ambiguous or unclear. Candidates should be encouraged to cross out work they do not wish to be marked, rather than writing their new answers over their old ones. The paper allowed candidates of all abilities to score marks throughout the paper and part marks were frequently awarded for showing appropriate method if the final answer could not be produced. There was no evidence to suggest candidates ran out of time, though it was evident that a minority gave up when the paper became more challenging, and questions were left blank. Some candidates did not have access to a ruler or protractor which meant they were unable to access the 3 available marks for drawing the triangle correctly in Question 10.

- Q1** Part (a), finding $\frac{1}{5}$ of £75 was generally well answered by candidates who knew to divide 75 by 5, although some then answered with £60, the new price rather than with £15, the saving. In Part (b) candidates had to find 25% of £80 and many were awarded 2 marks for successfully finding £20, mostly by dividing 80 by 4. A variety of approaches were seen, including finding 10%, 10% and 5% of 80 or attempting to multiply 80 by 0.25. Some candidates lost a mark for taking the £20 off the normal price and answering £60, the sale price.
- Q2** Despite being instructed to use approximations to estimate the total calories in Lisa's order many candidates attempted to find the exact total but received no credit for this incorrect approach. For those who did attempt to use approximations to estimate the calories in the items ordered a large number rounded inappropriately to 2, rather than 1 significant figure, for instance rounding 275 and 336 to 280 and 340 respectively. Others were careless in their reading of the information requested and worked with the values in the table rather than dealing with Lisa's order. It seems that a large number of candidates at this level are still not being adequately prepared for estimation questions in examinations.
- Q3** It was pleasing to see that quite a few candidates were able to correctly complete the spinner according to the instructions given relating to probability. A common incorrect response saw candidates labelling the spinner with the numbers from 1 to 6 inclusive, despite being told the spinner only had the numbers 1, 2 and 3 on it. Others just placed 2 of each of the 3 numbers on the spinner and received 1 mark for the two 3s being correct.

- Q4** In Part (a) candidates were asked to find how much wood in total was cut from a 7m length of wood when three 1.8m lengths were cut from it. Many candidates were able to multiply 1.8 by 3 correctly to produce 5.4m. Others used repeated addition of 1.8 to answer the question. Poor multiplication and addition were frequently shown, with candidates who displayed correct method being careless and inaccurate in their calculations. A minority of candidates who found the correct answer then went on to take it away from 7m to find 1.6m, the amount of wood remaining. A surprisingly common incorrect approach was seen when candidates attempted to divide 7m by 1.8. In Part (b), candidates were asked to explain if there was enough wood left to make another 1.8m shelf. Most candidates with correct answers to Part (a) were able to state ‘no’ and give an appropriate reason, such as ‘there is only 1.6m left’ or ‘he would need a total length of 7.2m to make another shelf, but he only has 7m’. Some candidates were careless in taking 5.4m from 7m and thought there was 2.4m left and explained that another shelf could be made. Candidates, in some cases, confused their answer to Part (a), the total length of wood cut with the amount of wood left over. Careful reading of the questions and checking of work should be encouraged to minimise these careless mistakes.
- Q5** This conversion graph question proved to be a good discriminator of ability with stronger candidates correctly answering both parts. In Part (a) candidates had to take a reading from the graph at €250 and were awarded a mark for answers between £205 and £210 inclusive. Most candidates were accurate in their readings, though some were slightly outside of tolerance. A small number of candidates took a reading at £250 and answered 300. In Part (b), it was pleasing to see some candidates able to take an appropriate reading from £160 and then answer ‘yes’ because ‘€390 is more than €385’ or similar. A minority of candidates failed to carry out a conversion and simply stated that £160 + €200 = €360 and decided that Callum needed another €25. Other candidates who changed €200 to £165 and produced a total of £325, failed then to attempt to convert this amount to euros, often just stating that Callum needed another €60. Weaker candidates often struggled with this part of the question as several steps were involved and many mixed up £s and €s.
- Q6** The majority of candidates failed to show understanding of metric and imperial units. Four units, miles, pints, kilograms and millimetres, were given and had to be placed correctly in a table with headings Metric units and Imperial units. A small minority of candidates correctly placed all 4 units and were awarded 2 marks. Most candidates did, however, earn 1 mark for correctly placing 2 units or for correctly pairing miles and pints and kilograms and millimetres and placing them in the wrong columns.
- Q7** Another estimation question, this time concerning a farmer supplying cucumbers to a supermarket. In Part (a) candidates had to estimate the number of cucumbers bought by finding 60% of 8000, after rounding 59% and 7882 up. Only the very best candidates were able to produce 4800 correctly, with many candidates failing to round and attempting to multiply 7882 by 59 or 0.59. Some candidates found 60% of 7900 and were generously awarded the 2 available marks if they produced 4740. Common unaccepted approaches included trying to find 59% of 8000 or 60% of 7880. Some candidates dealt with finding 60% of 8000 by finding 50% as 4000 and 10% as 800, before summing to 4800. Others multiplied 8000 by 0.6 or multiplied by 60, then divided by 100, but frequently made arithmetical errors. In Part (b) candidates had to explain why their estimation in Part (a) was an overestimate. Candidates who had been successful in Part (a) mostly gained the available mark for saying they rounded their values up. Incorrect responses included statements such as, ‘it wasn’t worked out exactly’ or ‘because I didn’t use a calculator’. Others simply stated it was an overestimate ‘because it’s bigger’.

- Q8** In Part (a) candidates were required to list the outcomes when a coin was tossed, and a spinner spun. While many fully correct responses were given a minority of candidates ignored the coin toss and just listed colour combinations from the spinner being spun twice, clearly showing careless reading of the question. Candidates were asked to explain clearly in Part (b) why the probability of getting a tail and a yellow is $\frac{1}{8}$, but only the strongest candidates were successful, often multiplying the probability of a tail, $\frac{1}{2}$, by the probability of yellow, $\frac{1}{4}$, and producing $\frac{1}{8}$. Most candidates with the correct outcomes listed in Part (a) were unable to provide a correct reason and this question proved to be a good discriminator by ability. There was no evidence that candidates tried to use the information given in Part (b) to go back and correct Part (a) if they had ignored the coin toss or listed the outcomes incorrectly.
- Q9** Estimating the area of a square with side 51.1cm was very poorly done, and only a handful of candidates rounded to 50cm and multiplied 50×50 to produce 2500. Many candidates failed to round 51.1 and attempted to find the perimeter by multiplying 51.1 by 4. Of those who did round to 50 several made an error when calculating 50 by 50.
- Q10** This triangle construction question proved to be a good differentiator of ability with better candidates earning all 3 of the available marks. Most candidates did score at least 1 mark, though it was evident that a minority of candidates did not have a ruler or protractor. Some candidates mixed up horizontal and vertical, drawing line AB horizontally, but still had access to 2 marks. A minority of candidates were inaccurate in their measurements and lost marks for being outside of tolerance with their line lengths or angle. More marks were awarded for line AC being 8cm long rather than at 70° from the vertical.
- Q11** The first 2 parts of this distance-time graph question were well understood by many candidates who had little difficulty taking readings at 40km in Part (a) and finding the length of stay in Exton as 40 minutes in Part (b), though candidates in Part (a) were generally more successful than in Part (b). Part (c), however, showed that candidates at this level struggle to deal with calculations involving time, with only a few able to correctly add 160 minutes to 8.30 am to find 11.10 am. A minority of candidates were awarded 1 mark for identifying that Paul left Exton 160 minutes (or 2 hours 40 minutes) after the start of the journey. Incorrect responses included 1070, from adding 2.40 to 8.30, and 9.90 by adding 1.60 to 8.30.
- Q12** Part (a), completing the table of outcomes for a spinner that is spun twice, saw most candidates pick up at least 1 of the 2 available marks, but inevitably when filling in 18 boxes, careless mistakes will be made by candidates which will cost them a mark. Candidates should be encouraged to check their work carefully as marks were needlessly lost in this question. Part (b) was less accessible to candidates at this level and they often struggled to provide an appropriate fraction, answering frequently with the most common score, 10, rather than its probability. As only 1 mark was available candidates needed to provide $\frac{5}{25}$ or an equivalent fraction to be successful. In some cases, candidates who had correctly identified the most likely score as 10 answered $\frac{10}{50}$.

- Q13** The skill being tested in this question, finding a percentage of an amount, was poorly understood by the majority of the cohort, with many unable to find 30% of 140g. Those who were successful generally found 10% as 14, then multiplied that by 3. Others tried to multiply 30 by 140 but forgot to divide by 100 or made arithmetical errors. It is clear that candidates who knew to multiply 30 by 140 and divide by 100 were capable of solving this problem using a calculator, but candidates at this level also need to be able solve simple problems such as this using non-calculator methods. Many wrong approaches were seen, including candidates attempting to divide 140 by 30. Some candidates who found the correct answer of 42 then took it away from 140 and lost a mark.
- Q14** Candidates sitting this paper struggle to add fractions with different denominators and only a few candidates earned any of the three available marks. For those who found 35, the common denominator, most arrived at it by multiplying the given fractions rather than by attempting to add them and received no credit. The most common incorrect response was $\frac{3}{5} + \frac{2}{7} = \frac{5}{12}$, or $\frac{7}{12}$ if the candidate took it away from 1.
- Q15** This question, which tested candidate ability to scale up amounts using proportion, proved to be a very good discriminator by ability. Better candidates realised that two and a half times as many chocolate muffins would be sold in the afternoon as in the morning but were sometimes unable to multiply 8 by 2.5 correctly. Others gained a mark for showing $\frac{8}{20}$, the proportion of chocolate muffins sold in the morning. Some candidates tried to work up from 20 to 50, by doubling 20 and 8 to 40 and 16 respectively but were unable to progress further. A variety of approaches were attempted but few at this level understood the concept of a relative fraction and some candidates may have fluked the correct answer of 20 by simply summing the table of values given.
- Q16** Candidates were given $\frac{29400}{245} = 120$ and asked to write down answers to other related calculations. Part (a), $\frac{2940}{245}$, proved to be the most accessible part of this question, with a small majority of candidates correctly answering 12. In Part (b), candidates often tried to multiply 245 by 240 to find the answer, but none were able to produce 58800. This was the least successful part of the question. Part (c) was frequently left blank and only a small minority of candidates produced 29.4, the answer to 24.5×1.2 . It is clear that candidates at this level are unable to recognise that the quotient given also can be expressed as $245 \times 120 = 29400$, which would have helped them in Part (b) and Part (c).
- Q17** It was pleasing to see candidates of all abilities still picking up marks on the final question of the paper. Candidates were awarded 1 mark each for stating 'rotation', '180°' and 'about the origin' or equivalent. Few candidates were awarded all 3 marks, but many candidates picked up 1 or 2 marks for showing some understanding of the transformation given. No marks were awarded to candidates giving more than one transformation. Quite a few candidates described the transformation as a translation. A common incorrect response was 'go 9 left and 7 up, then flip the shape over' or similar. Some candidates failed to use the term 'rotation' and stated 'turn' which was not awarded the mark.

Assessment Unit M5 Foundation Tier Calculator

Unit Overview

This proved to be quite an accessible paper for many in the cohort with quite a few candidates scoring marks over 30. Marks ranged from single figure scores to strongest candidates scoring in the mid-40s out of 50. There were quite a few probability questions on this paper and in common with previous examination series candidates frequently answered with words of likelihood rather than with fractions when required. It was pleasing to see, despite this being a calculator paper, that the majority of candidates were showing their methods clearly and sufficient working out to enable the award of part marks if the final answer was not achieved. As noted on the corresponding non-calculator paper the standard of handwriting in some cases was very poor. The paper allowed candidates of all abilities to score marks throughout the paper and was successful in differentiating candidates by ability. There was no evidence to suggest candidates ran out of time, though it was evident that a minority gave up when the paper became more challenging, and questions were left blank. It was clear that some candidates did not have a ruler and were unable to meaningfully attempt the scale drawing in Question 5. Some candidates may not have had a calculator as questions on a number of scripts showed calculations that the use of a calculator would have made redundant.

- Q1** This question testing scale was accessible to most of the cohort, who had little difficulty reading 780 from the scale in Part (a) and marking 56 on the scale in Part (b). In Part (a) some candidates lost the mark as they didn't realise the scale was going up in 20s with 799, 775 and 790 seen. In Part (b) a minority of candidates were careless in their placement of the arrow at 56, instead indicating 55 or 57, and a handful of candidates marked 44, clearly counting from the left-hand side of 50 rather than the right-hand side. Part (c) was less well done than the first two parts, but many candidates still scored at least 1 of the 2 available marks for realising that the speed limit was not being broken or for taking the correct reading of 45km/h from the scale. Some candidates did struggle to show understanding of the scale and a common incorrect reading of 48 was often seen, which was the speed limit.
- Q2** In Part (a) most candidates were able to draw the two correct lines of symmetry on the shape and were awarded the available mark. A minority of candidates only provided 1 line of symmetry, but there was no mark available for this response. Some candidates drew the correct lines but added 2 diagonal lines which were incorrect, again leading to no marks being awarded. It was pleasing to see so many correct reflections of the quadrilateral in Part (b) and even those who were slightly careless or inaccurate were often awarded 1 of the 2 available marks. A common incorrect response was to draw the correct reflection starting one square to the right of the mirror line rather than from the mirror line. Weaker candidates simply translated the shape and scored no marks.
- Q3** This relatively straightforward question testing knowledge of likelihood was disappointing as most respondents scored 1 mark or fewer out of the 3 available and it was only the very best candidates who managed to achieve full marks. In Part (a) candidates in the main failed to spot that 30 flags out of a total of 60 would lead to a likelihood of evens rather than likely. Many clearly associated the largest number of flags, 30, as being the most likely outcome rather than considering its actual likelihood. Part (b) was much better answered than Part (a), although a majority of candidates still failed to realise that 12 flags out of a total of 60 would lead to an unlikely likelihood. Part (c) was the most successful part of the question with a good proportion of the cohort knowing that it was likely that a capital would be chosen not in Asia.

- Q4** Most candidates, in Part (a), were able to find 43 as the next term in the sequence by adding on 8. Some incorrect answers frequently seen included 42 or 44. Part (b) proved to be a good discriminator of ability and better candidates realised 90 could not be in the sequence as the other terms were all odd. The most common accepted response saw candidates continue adding 8 until they reached 91, then state that 90 was not in the sequence and 91 was the closest number to it. Others were allowed the mark for stating that no terms in the sequence ended in a 0 as the other terms all ended in numbers such as 1, 3, 5, 7 and 9.
- Q5** This was a poorly attempted question with many candidates awarded 0 or 1 mark only out of 3 for using a scale drawing to find the height of a ladder above the ground. Quite a few responses were blank while others picked up a mark for drawing the 4cm baseline or the 16cm ladder within tolerance. Most stopped after drawing the ladder and did not attempt to calculate the required height. Candidates attempting to find the height often failed to divide their measured height by 4. A very small minority of candidates were awarded full marks.
- Q6** This question, calculating which company pays the higher wage and by how much, was a good discriminator of ability. Most candidates scored at least some of the 3 available marks and it was pleasing to see quite a few fully correct responses. A common misread was to use 7 days instead of 5 days for The Car Guys giving a wage of £788.90. Others misunderstood 'Monday to Friday' and treated this as 2-days work rather than 5. Some candidates did not use a calculator to work out the wages and made little progress, while others were careless when transferring their calculator answer to their paper and lost marks needlessly.
- Q7** Part (a), changing 16 stone 5 pounds to pounds was generally well answered by candidates though some converted 16 stone to 224 pounds and forgot to add on the 5 pounds. It obviously helped candidates at this level to be given the conversion, 1 stone = 14 pounds. In Part (b), only a very small number of candidates were able to recall the correct pound to kilogram conversion. As a result a score of zero marks was the norm. A few candidates did produce the correct answer and gained both marks. Whilst Part (a) was very accessible to candidates, Part (b), without the conversion being given, proved beyond the grasp of all but the very best candidates.
- Q8** This three-part question on probability proved straightforward for stronger candidates who earned all 3 marks for correctly identifying the letters matching the various probabilities. Despite the instruction to answer using 'the letter' being emboldened many candidates answered using fractional probabilities or with words such as unlikely, certain etc. In Part (a) many candidates correctly identified G, at 1 on the probability scale, as the probability of the spinner landing on a number less than 4. Some candidates answered A, at 0 on the scale, possibly misreading the question as the spinner landing on 4. Part (b) was also well answered with plenty of correct responses for the dice landing on an even number, though some candidates answered with 'evens' which was not allowed a mark. Part (c), the most challenging part of the question, proved to be a good discriminator by ability and better candidates were able to identify C (or $\frac{4}{12}$ or equivalent) as the correct probability for the bead being yellow. However, some candidates answered E, at $\frac{8}{12}$, probably having added the number of non-yellow beads and forgetting to subtract from 12.

- Q9** Many candidates understood that this question about painting the outside of 15 houses depended on a constant rate. In Part (a) for those who reasoned that if it took 2 days to paint 6 houses then 3 houses could be painted in one day, the correct answer of 15 days was often given. A common incorrect response was 4.5 days, where candidates correctly reasoned that 12 houses would take 4 days, but then erred when thinking the final 3 houses would take half a day, rather than half of 2 days. In Part (b) the assumptions anticipated in the mark scheme were rarely seen, but candidates were frequently awarded the available mark for showing an awareness of the necessity for a constant rate of painting. A variety of other responses around an assumption made in Part (a) which related to the practical reality of the time taken to paint 15 houses was accepted, for example, that the weather wasn't too wet or stormy to paint in, that none of the painters were sick etc.
- Q10** Candidates, on the whole, demonstrated a poor awareness of square, cube and triangular numbers across the three parts of this question. Better candidates gained 2 or 3 of the available marks but much of the cohort gained 0 marks or 1 only, possibly by just guessing. Candidates, in Part (c), were able to identify the triangular number 21 less successfully than the square and cube numbers in the earlier parts. Overall it is disappointing that such basic knowledge is not widely known and understood at this level.
- Q11** Better candidates generally had no problem enlarging the chevron shape on the grid using a scale factor of 3. For candidates who understood what was required, marks were carelessly lost sometimes due to poor counting or failing to check that opposite sides were the same length. Candidates may not have had a ruler in some cases and several responses were very poorly drawn freehand. The question proved accessible to most candidates as there was no centre of enlargement provided. Common errors included enlarging by the wrong scale factor, usually 2, or failing to enlarge all three pairs of sides consistently.
- Q12** Questions on ratio at this level are extremely challenging for most of the cohort and this question, on the total price of the mixed paint, proved so once again. Only a small minority of candidates approached this question with understanding and were able to correctly sum the total parts to 35, at which point they were then mostly able to multiply by £18.25 to give a total price of £638.75. Most candidates, however, were unable to get started and many simply multiplied each of the parts 4, 2 and 1 by £18.25, summing these to £127.75, gaining no marks. Another common approach was to multiply the 10 litres of blue paint by £18.25 and answer £182.50, which also gained no marks. Some candidates summed the parts given to 7 and divided this into £18.25, the cost per litre of paint, and received no credit for following a wrong method. A small minority of candidates misread the information presented and worked with 10 litres of red paint, 5 litres of blue paint and 2.5 litres of yellow paint leading to an answer of £319.38, or £319.37, which was allowed 1 mark. For those working with 10 litres of yellow paint there was no follow allowed as the problem had been trivialised.

- Q13** This three-part question tested candidates on their knowledge of applying probability in context, in this case a raffle with tickets numbered from 1 to 20. Candidates should know at this level that answers are expected in fraction or decimal form, and that words expressing likelihood are not acceptable. Unfortunately, inappropriate answers were given routinely for each of the parts. In Part (a) an answer of $\frac{9}{20}$ was expected for the probability of a number less than 10 being drawn. The correct answer was rarely seen and an answer of $\frac{10}{20}$ was just as likely. The most common response, however, was ‘evens’. In Part (b), better candidates answered correctly with $\frac{6}{20}$, the probability of a number more than 14. Many candidates answered ‘unlikely’. Part (c), the most challenging part, saw very few correct answers as often even the better candidates were unable to answer correctly with $\frac{8}{20}$, the probability of a prime number.
- Q14** This question allowed better candidates to demonstrate their problem solving skills and a small minority were awarded 3 marks for producing the correct answer of £55. Others, who showed appropriate method were able to work to 110 coins but failed to multiply by £0.50 and gained 2 marks. A number of candidates found the weight of 1 coin as 8 g and were allowed 1 mark. A variety of approaches were attempted but at this level only the strongest candidates showed understanding. Many got lost in the question and were unable to distinguish between coins, weight and money and added, subtracted or divided the values given in the question.
- Q15** This ratio question was a very challenging question for candidates sitting the paper and no marks being awarded was the norm. Candidates frequently misunderstood the information they were presented with and what they were being asked to solve. A sizeable number of those attempting the question divided £64, the cost of the meal, by 2 as there were 2 people or by 3 as Ben paid for 3 of the 4 parts of the meal, with only a handful dividing correctly by 4. Generally, those dividing by 4 were able to produce £48, Ben’s share of the meal and then find £12 as the taxi fare.
- Q16** Again, a probability question that candidates at this level were confused by, not knowing in what form to give their answers. The majority of candidates still attempting to answer questions at this late stage in the paper answered with words of likelihood, such as ‘unlikely’ or ‘likely’. Few attempts to provide fractional answers were seen and the majority of these were inappropriate. Weaker candidates tended to answer with the number of patients in the categories they identified from the information in the question, rather than with probabilities, so answers such as 13 in Part (a) and Question 9 Part (b) were common. Of candidates showing understanding, some who gained the mark in Part (a) for $\frac{13}{33}$ incorrectly used the denominator 33 again in Part (b).
- Q17** The final question on the paper saw many candidates who had persevered with the paper earning 1 mark for correctly summing the given angles to 330° . Very few candidates, however, knew to subtract this total from 540° , the angle sum of a pentagon. The most common response given was 30° , which candidates found by subtracting their total from 360° .

Assessment Unit M6 Foundation Tier Non-Calculator

Unit Overview

As per usual, this paper tested a range of mathematical skills and appeared to be well differentiated. Weaker candidates had the opportunity to demonstrate their abilities in the earlier to mid sections of the paper, while those more able had to work to the end to show their strengths.

As always, allowances were made for basic errors and follow through marking used when early errors produced unexpected answers. There were no obvious time issues but weaker candidates definitely struggled with the more difficult and higher graded questions towards the end of the paper.

Topics that were best answered on this non-calculator paper included reading the conversion graph, listing outcomes, reading the distance/time graph and completing the probability table, while those that proved particularly difficult were the estimation questions along with the fraction one and the ‘given that’ write an answer to question. Not surprisingly, the construction and calendar question at the end of the paper were very poorly done.

- Q1** There were very few candidates who got the full 2 marks for correctly placing the 4 units in the correct category. Most gained 1 mark for placing 2 or 3 of the units correctly, for pairing ‘miles’ and ‘millimetres’ in the Metric column and ‘pints’ and ‘kilograms’ in the Imperial column or for the correct pairing but in the wrong columns.
- Q2** Many candidates failed to realise that the estimation is easiest when the 7882 and 59 are both rounded correctly to 1 significant figure. A number did round the 59 to 60 but often attempted to work unsuccessfully with the 7882 cucumbers. Those who did use a correct estimation process were able to articulate in Part (b) that both numbers being rounded up in this case would lead to an overestimate.
- Q3** In this conversion graph question, Part (a) was generally well handled with answers from 205 to 210 inclusive being acceptable. Some had difficulty in Part (b) which involved several steps to attain the correct comparison. Part marks were again awarded for reaching each stage of the process.
- Q4** There were lots of different methods on display here for ‘listing’ and generous marks were awarded for correct ‘implied’ outcomes. CA number seemed to ignore the coin being tossed and considered the spinner being spun twice thus leaving Part (b) unanswerable. A good many obtained the mark in Part (b) for referencing the 8 possibilities or stating ‘there is only 1 tail and yellow’ having listed correctly the paired outcomes in Part (a). Better candidates who suggested that $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$ also gained the mark.
- Q5** Surprisingly, this question was very poorly answered with the majority of candidates trying to calculate the perimeter of the square rather than the area. For those who did estimate and did attempt to calculate the area, often an answer of 250 instead of 2500 was incorrectly given.
- Q6** This construction of the triangle was well answered by many, with a lot getting at least 2 of the 3 marks. Those who began by mixing up the words horizontal with vertical and drawing AB on the ‘flat’ were able to access a possible 2 marks for a correct angle and drawing the correct lengthed AC line. A mark was deducted if the triangle was not completed.

- Q7** Part (a) and Part (b) were generally well handled with Part (c) proving more difficult. One mark was awarded for indicating that the time Paul left Exton was 2h 40mins (or 160 mins) after the start of the journey. Some recognised the ‘160’ but just added to 8:30 getting 9:90 which they then changed to 10:30.
- Q8** Part (a) was very well done and while most candidates did answer Part (b) correctly, common errors included just writing the ‘most likely’ score of 10 rather than giving the probability of the ‘most likely’ score or writing an incorrect probability of $\frac{10}{25}$.
- Q9** Those who were unable to calculate a simple percentage without a calculator had obvious difficulties with this question. A common incorrect approach was to try to divide 140 by 30. There were also some who, having obtained the correct answer of 42g, proceeded to subtract this from the initial 140.
- Q10** This ‘adding fractions’ question proved to be a mystery to many with the majority simply adding the two numerators and adding the two denominators rather than using a common denominator. Hence $\frac{5}{12}$ and a common wrong answer of $\frac{7}{12}$ to finish were often seen. There were no follow through marks awarded for incorrect conversions of the given fractions.
- Q11** This question discriminated very well between candidates of differing abilities and various methods were employed. Marks were given for expressing the number of chocolate muffins sold in the morning as a relative fraction or indicating that we could progress if we could figure out how many chocolate muffins we would expect to sell in total, given the extra 30 pastries sold in the afternoon. Some worked logically with the idea that if 2.5 times as many muffins were sold in the afternoon then we would expect 2.5 times as many chocolate ones to be sold. No marks were awarded for just getting 20 as the total for morning sales.
- Q12** While quite a few managed to get the correct answer of 12 in Part (a), many found Part (b) and Part (c) to be difficult. Here candidates needed to see first that the quotient given could be expressed as $29400 = 245 \times 120$ to allow them to determine the answers to the questions posed. Although not encouraged, those who were able to attain the correct answers through multiplication were not penalised in this case.
- Q13** The best candidates were able to gain all 3 marks while there were marks available for weaker candidates who gave parts of the correct transformation. A common mistake amongst the weakest pupils is mentioning 2 different transformations in the one answer. If this is done, no marks can be awarded. Also for this question, because the rotation is 180 degrees, there is no mark for referring to anticlockwise/clockwise.
- Q14** Weaker candidates do find binary difficult with many not having the correct ‘set up’ to allow them to answer correctly. The most common mistakes here were in the actual column headings; either leaving out 1 at the end, doubling up incorrectly or reversing column headings. The very best students were able to get all 3 marks but there was also a good opportunity to at least get 1 or 2 marks late in the paper for the $\frac{54}{74}$ seen.
- Q15** There was lots of guess work going on here with only the very best gaining marks. While some knew that arcs were involved, the placement of these on the page appeared in some cases to be contrived with many drawing in the perpendicular first and some even attempting to do the construction without the use of a compass and drawing freehand. There are a variety of methods that can be used here with each awarded the appropriate marks.

- Q16** This question was designed to test the best and while a lot of candidates managed successfully to get the first 2 marks for the correct nth term formula, they were then unable to progress any further with the inequality. A few did gain extra marks for their perseverance with a ‘trial and improvement’ method and this was good to see at this level.
- Q17** As expected, this proved to be a difficult question for most candidates. While many attempted to answer it by drawing out a calendar and eliminating dates, it was disappointing to see candidates begin with 31 days in September. A number wrote $\frac{2}{7}$ or $\frac{3}{7}$ as their answer, basing it on unavailable days in a week while many failed to appreciate that there aren’t the same number of each day in September. Marks were awarded on the basis of identifying ‘9’ dates she couldn’t do, the ‘25’ dates that were possible to be given and the last mark for writing the correct probability.

Assessment Unit M6 Foundation Tier Calculator

Unit Overview

In this paper, opportunities were provided for all candidates to be assessed on the syllabus and many made good attempts, with efficient use of their calculator, to answer the majority of questions. The paper again provided a good mix of procedural type questions together with those more thought provoking. As expected there was the usual range of scores relative to ability.

On this calculator paper, highest marks were achieved in the early questions including the comparison of companies, weight in pounds, probability scale and painting houses. Those that were not well received included finding the heavier player, the scale drawing, the prime number probability, bearings and relative frequency.

- Q1** This ‘money’ question was answered well in the majority of scripts with careless errors made in calculator use, rounding or incorrect money notation. A common misread was using 7 days instead of 5 for ‘Car Guys’, but an allowed follow through for one error resulted in many getting 2 out of the 3 marks available.
- Q2** Part (a) was generally well answered though quite a few forgot to add the ‘5 pounds’ to their correct multiplication, giving 224 rather than 229 as their answer. As this was the first series since 2020 where candidates were not provided with additional notes, it was obvious that many were not able to recall the conversion of $1\text{kg} = 2.2\text{lbs}$ needed in part (b) to answer successfully.
- Q3** This question did require a correct interpretation of the ‘probability scale’ given to answer with a requested letter, but generous marks were awarded for the many correct answers given as fractions/decimals. Part (a) and Part (b) were well answered by the majority though in Part (c) some didn’t answer the question asked about ‘yellow’ but rather added blue and pink beads to get $\frac{5}{12}$ simplified to $\frac{5}{12}$ and then giving E as their answer.
- Q4** This should have been a straightforward question but it was surprising how many failed to achieve the 3 marks available. Most picked up 1 mark for placing ‘their’ ladder at the correctly scaled ‘4cm’ from the base of the wall. A number got the correct ‘16cm’ ladder drawn but most stopped at this stage and did not calculate the height of the top of the ladder above the ground. A few did measure but failed to divide by 4 or misread the question and calculated the length of the wall above the ladder.
- Q5** In this question, the majority scored well to give ‘5 days’ as the correct answer in Part (a) but many gave in Part (b) a description of their calculation in Part (a), rather than a practical assumption, like ‘the houses need to be the same size’ or ‘the same rate of working is maintained’, which enables the calculation.
- Q6** This was pretty much a mixed bag with errors being made in all 3 parts. Weaker candidates quite often mistakenly identified ‘2’ as being the square number while guesses were being made for which were the cube and triangular numbers. Better candidates had no difficulty.
- Q7** Candidates should be encouraged to complete all ‘drawing’ questions with a pencil. It was evident that a number started with a pen, made errors and then tried to remove these which often led to a ‘mess’ on the page. Common errors were to use the wrong scale factor completely, leave some of the lengths long/short or to just reproduce the given shape. Some also felt that they had to rotate the shape but marking was generous here for use of the correct scale factor.

- Q8** This question was a good discriminator with the better candidates able to associate the 10 L with the '2' part of the ratio and calculate the missing amounts of '20 L' for red and '5 L' for yellow for the first mark. Those weaker often just added the 3 values together to get '7' and worked with this and the £18.75 to get a total price thus gaining no marks. Follow through was available for a single error in calculating the number of litres in the mix and a mark was lost if candidates rounded the price per litre to £18 rather than use the full value.
- Q9** The majority picked up some marks in this probability question. Errors made in the first two parts were due to a miscount of the number of values less than 10 or more than 14 while in Part (c), those weaker were not able to identify all the primes less than 20. Again correct decimal or percentage answers given were accepted here but candidates should be encouraged to leave their answers as fractions rather than risk changing to a 'wrong' alternative.
- Q10** Alternative approaches were used to complete this question with most trying to find the number of coins in 880g and then proceeding to calculate their value. Weaker candidates were unable to distinguish between number of coins, mass and value and often produced 'confused' combinations of working with the given values.
- Q11** This type of ratio question proved slightly more acceptable to candidates than the one asked earlier. There were no marks awarded to the common errors of $64 \div 3$ or $60 \div 4$ but most picked up part marks for identifying £48 and £16 as the 'meal share' amounts.
- Q12** This question was well answered by the better candidates with common errors being in Part (a) to misinterpret and write $\frac{13}{19}$, the probability of a patient aged over 30 being selected and then having had an extraction or in Part (b) $\frac{9}{33}$, the probability of a patient being selected and then being under 30 and having a filling.
- Q13** Candidates either chose to calculate first the 540 'total of interiors' or the 330 total for the angles given. Those doing the latter often proceeded to give their final answer as 30° - having subtracted the 330 from 360. Those who had the 540 to begin often gained the full 3 marks available.
- Q14** This question tended to be well done by all with the common wrong answers being x^8 or x^{15} .
- Q15** It was good to see some marks being achieved by the weaker candidates in this 'standard' trial and improvement method question. As always it is expected that candidates show all their method carefully as no marks are awarded for the correct answer only appearing in the answer space. It is also important that a 'test value' is carried out as part of the method to determine the correct one decimal place answer in this case and that candidates do not use a 'closer to' method as a way of reaching their choice. Part marks, as always, were awarded on reaching various stages in the method.
- Q16** It was good to see weaker candidates picking up the mark in Part (a) for the correct bearing but Part (b) however proved to be a much greater test with the majority unable to get the 'drawing' started. It was expected that those attempting to show the flight path of the planes would draw lines to indicate direction - no marks could be awarded if 'dots' were just drawn on the page. Only the better candidates realised that these lines had to be continued to find the 'intersection' point as the position of the plane.

Q17 As is the norm, relative frequency often causes problems for the majority and this question was no exception. In Part (a) most failed to appreciate that the longer an ‘experiment’ is continued then the better the ‘last results’ can be used to best estimate the probability of the ‘event’ happening. Most just said it looked as if the probability was a $\frac{1}{2}$ and that as Kate increased her throws she had a better chance of getting the bean bag in the bonus hole. Hence 150 was the most common wrong answer in Part (b).

Assessment Unit M7 Higher Tier Non-Calculator

Unit Overview

All candidates were able to make a good attempt at all questions.

As always candidates are encouraged to show all their working as marks are awarded for partially correct solutions, as stated in the instructions at the front of the exam paper.

Some candidates should take care with the formation of their figures; at times it was difficult to distinguish between 0 and 6 and between 4 and 7.

Q1 On this estimation question, some candidates did not estimate and attempted to work out the exact area. Some worked out an estimate for the perimeter. Some wrote down 50×50 but gave 250 as the answer. This is a case which highlights the importance of showing work as 50×50 got the method mark.

Q2 The accurate drawing was generally well done. Some errors were seen with the measurement of the angle 70° . A few started out incorrectly and drew a horizontal line instead of a vertical line.

Q3 This question was generally well answered. A few errors with working out the time in Part (c).

Q4 This was also generally well answered. A small number of candidates made errors in the table of values. Part (b) was also well answered. Some candidates who knew 10 was the mode gave an incorrect answer of $\frac{10}{25}$.

Q5 This question was generally well answered. Again, the importance of showing working out is seen as the correct method shown could attain one mark. Some candidates attempted to divide 140 by 3, perhaps thinking that 30% is $\frac{1}{3}$.

Q6 Question 6 was fairly well answered. Most candidates knew to add the 2 given fractions. Some incorrectly added the numerators and denominators to get $\frac{5}{12}$.

Some who knew to get a common denominator of 35 made an error with calculating 3×7 or 2×5 .

Some candidates got to $\frac{31}{35}$ and lost the last mark.

Some candidates subtracted or multiplied the fractions.

Q7 Candidates adopted many different valid approaches. Some used probability and worked out $\frac{8}{20}$ of 50. Those who did not simplify the fraction struggled to divide 50 by 20.

Some candidates used proportion and knew that if 8 muffins were sold in 20, then 4 in 10 which led to $8 + 8 + 4$ seen.

Some left their answer as $\frac{20}{50}$ and lost 1 mark.

Q8 Question 8 Part (a) was generally well done, Part (b) and Part (c) proved more difficult. However, some candidates do not use the calculation that is given to them and just attempt to work out 245×240 .

- Q9** Generally well attempted but not all candidates were able to give all 3 parts to their full description. Some left out the point (0,0). Some did not use the word rotate or rotation. Some wrong answers were seen. Again, it should be emphasised that a single transformation is required.
- Q10** The binary question was well attempted. Some candidates made a numerical error when working out 54 but went on to gain 2 marks. Some candidates were using a wrong approach and writing out 1 2 4 8 etc. instead of 8 4 2 1.
Some candidates left out 1 and started with 2.
- Q11** This was a poorly done question with candidates not knowing how to construct the perpendicular from point P. Often the question was left out or some incorrect arcs were drawn.
- Q12** This was a question involving the use of the n th term. Candidates who worked out the n th term got 2 marks. Some used an inequality or an equation, but most seemed to use trial and improvement by trying different values for n .
- Q13** This probability question was very poorly answered. If candidates had drawn out the dates for September, it should have helped them. Many assumed the denominator was 30 and did not subtract the 5 days.
- Q14** This was well done by candidates who knew how to work with standard form, however many candidates did not seem to know this topic. Some candidates made an error in calculating 2.5×8 . Some candidates attempted to change the given numbers into ordinary numbers but were unable to work out $250\,000\,000 \times 0.08$ correctly.
- Q15** Many incorrect answers of $\frac{3}{4}$ or $\frac{1}{4}$ or $\frac{4}{3}$ given. A few did get the correct answer.
- Q16** This reflection question was quite well done. However, some candidates did the reflection in the x-axis or the y-axis.
- Q17** This Question 17 was well attempted, and candidates could gain part marks for correct work seen.

Assessment Unit M7 Higher Tier Calculator

Unit Overview

As for the non-calculator paper, all candidates were able to make a good attempt at all questions.

As always candidates are encouraged to show all their working as marks are awarded for partially correct solutions, as stated in the instructions at the front of the exam paper.

Some candidates should take care with the formation of their figures; at times it was difficult to distinguish between 0 and 6 and between 4 and 7.

Q1 This proved to be an easy start for most candidates, but some candidates were making errors with choosing the square number, cube number and especially the triangular number.

Q2 Question 2 was well done. In part a the majority of candidates could get to the correct answer of 5 days. Some misunderstood the question and worked out $3 \times 15 = 45$.

In Part (b) candidates were able to give answers such as the houses are the same size, 3 houses are painted in 1 day or another suitable assumption.

Q3 This was also well done. A few candidates did make an error with one or two parts. Some candidates did another scale factor, such as 2.

Q4 This question was well answered with many candidates working out 35 litres and getting to the correct answer of £638.75.

A wrong approach was to start with $4 + 2 + 1$ and then attempting to use 7 in their working.

Q5 Question 5 was well answered. Some candidates gave $\frac{10}{20}$ as their answer for Part (a).

Part (c) also caused some difficulty with the prime numbers, 1 often being included or one of the correct prime numbers being left out.

Q6 This was well answered with many candidates getting to £55 for 3 marks. Some made a good start and got to 110 coins but had difficulty working out the value of the 110 coins. Some tried to start with $880 - 560 = 320$ but couldn't get anywhere with this.

Q7 This question was also well answered with the correct answer of £12 seen many times. A few candidates who did not get the correct answer of £12 were able to get 2 marks for their correct calculation of £16 and £48.

Some candidates started out incorrectly by dividing 64 by 3. Some divided 60 by 4. Some added 60 and 64.

Q8 Part (a) was better done than Part (b). An incorrect answer of $\frac{9}{33}$ was sometimes given in Part (b).

Q9 Question 9 was well answered with candidates starting off with getting 330, working out 540 and then correctly finding $540 - 330 = 210$.

Some candidates did $360 - 330 = 30$

Some candidates made no attempt to show working out for the sum of the interior angles in a pentagon and just wrote down wrong values such as 500 or 520.

Q10 Question 10 was well attempted. The correct answer of x^{15} was seen but so was the wrong answer of x^8 .

- Q11** For trial and improvement questions such as this, candidates are instructed to show their working out and an answer of 3.6 did not gain 4 marks unless the correct working out was seen.

Many candidates were able to get to showing that $x = 3.6$ is too small and $x = 3.7$ is too big and then conclude that the answer is $x = 3.6$ because 14.76 is closer to 15 than 15.54. However candidates must show that they have tried $x = 3.65$ or another suitable value to show that the answer is closer to 3.6

- Q12** Part (a) was looking for a probability to be given and a correct reason. This was poorly done. Many candidates did not give a probability but rather wrote 104 or 200 or another number. A wrong approach was to give $\frac{1}{2}$ as the probability and to say that the results are close to one half. Another wrong reason given was to say that the more throws meant that she was getting better at the game. The best estimate for the probability comes from using 104 and 200 as this was the data from the most throws. Part (b) was well answered by those who knew to use the fraction $\frac{104}{200}$ and to get to 156. Some candidates were working out $300 \div 2 = 150$ or using the table's result for 100 which was 49.

- Q13** Question 13 was a bearings question. In Part (a) some candidates were giving wrong answers.

In Part (b) it was disappointing to see candidates not drawing in the lines from A and from B. If they had drawn in the lines they may have got a mark. Many candidates did not seem to know this topic.

- Q14** This question required candidates to set up simultaneous equations and solve them. Candidates who knew to do this did very well and were able to gain all 6 marks. Some made a numerical error but were able to get follow through marks. Some gained the first 2 marks only. Some who did change both equations to make the coefficients of x (or y) the same, went on to try to add the equations instead of subtracting them. Some candidates were using trial and error and did not know to use simultaneous equations.

- Q15** The change of subject proved difficult for some candidates. Some however gained 1 mark for showing $x^2 = yz$

- Q16** This probability question was well attempted. Many candidates were able to complete the tree diagram. Some forgot to label the branches and lost one mark. Some candidates made an error with $1 - 0.12$ and wrote 0.78. A few wrote 0.5 instead of 0.05. Some were completely wrong with 0.05 and 0.12 on the branches.

Part (b) was well done by some. A common wrong answer was to add the probabilities rather than to multiply them.

Assessment Unit M8 Higher Tier Non-Calculator

Unit Overview

This paper was generally well answered and candidates attempted all the questions. It proved very successful in encouraging candidates of differing abilities to respond positively. Many questions were quite predictable in nature and candidates who had prepared well had no difficulty recognising and responding to them.

- Q1** Most candidates were able to change the binary number to a decimal correctly, add 20 and convert back to binary notation, but surprisingly many made errors in adding the 20.
- Q2** This construction of the perpendicular to a line from a point was very difficult to mark because of the variety of approaches. Several acceptable methods were offered by candidates, knowingly or not, but the most common approach seemed to be to use a protractor to draw the perpendicular and add a selection of arcs to the diagram, none being relevant to the acceptable construction methods. Thus half the entry scored zero on this question.
- Q3** Nearly a quarter of the candidates found the formula for n th term of the sequence and used it to find the first term greater than 1000. The remainder generally gained some marks either by finding the n th term or by using trial and improvement to find the answer.
- Q4** This probability question proved more testing than anticipated. Careful reading of the question was essential, but many ignored vital parts of the information given and were unable to gain many marks. The most common wrong answer was $\frac{14}{30}$.
- Q5** Nearly half the candidates completed the standard form calculation correctly, while others gained some marks for calculations involving some numerical errors.
- Q6** This very standard question about the effect of enlargements on area produced, as usual, a rather disappointing response, in that just over a third of the entry gained the mark.
- Q7** This reflection question was well answered by the stronger candidates, although many rotated the triangle or reflected it in the wrong line.
- Q8** This question involving two types of variation allowed most candidates the opportunity to demonstrate some understanding of the topic and nearly half gained the full four marks.
- Q9** In Part (a), most deduced that $a^2 = 25$, but many missed the negative value for a .
In Part (b), half the candidates were not able to find the gradient of the radius as the starting point, but nearly 30% were and continued right through to the correct formula for the tangent.
- Q10** Changing a recurring decimal to fractional form was generally well done in Part (a). In Part (b), the majority of candidates interpreted indices correctly.
- Q11** Finding the length of the side of the cube with space diagonal of length 9 proved challenging for all but the best candidates, with many candidates not finding a good starting point.
- Q12** As in previous series, this type of probability question elicited a very encouraging response for a question so late in the paper. A majority gained full marks in Part (a) and the better candidates also scored well in the more complicated Part (b).

- Q13** This difficult question tested the understanding of surds and proved a good discriminator, with most candidates gaining some marks but only the very best gaining the full five marks.
- Q14** In an uplifting end to the paper, candidates did very well overall in distinguishing between exponential curves.

Assessment Unit M8 Higher Tier Calculator

Unit Overview

This calculator paper was well received by the majority of the candidates who performed positively. It allowed for all levels of ability at this tier of entry, but a significant number presented poor answers and gained little by sitting this paper.

- Q1** This algebraic indices question provided a very positive start to the calculator paper.
- Q2** The response to this trial and improvement question was also positive with most candidates making a good attempt and the majority gaining full marks.
- Q3** This relative frequency question had a more mixed response, especially regarding explanations in Part (a), with many candidates confusing the accuracy of throwing with the reliability of results. In Part (b), more understood how to use the relative frequency to predict future outcomes.
- Q4** It was surprising that over half the candidates at this level were unable to give the correct bearing from the diagram. Just over 40% were able to accurately draw two bearings in Part (b) to find a point of intersection.
- Q5** This simultaneous equations question was very well attempted with over three quarters of the entry gaining the full six marks.
- Q6** The rearrangement of the formula was pretty well done on this paper.
- Q7** There was a very mixed response to this transformations question. In Part (a), only a quarter of the candidates gave all three of the required elements to fully describe the enlargement. In Part (b), nearly one third gained the full three marks, but just over half scored zero.
- Q8** This compound interest question was generally well attempted, but more careful reading of exactly what had been asked for would have resulted in an extra mark for many candidates.
- Q9** This structured question on graphical solution of quadratic equations was a good discriminator amongst the better candidates, but obviously challenging for many of the entry.
- Q10** Again a probability question towards the end of the paper brought the best out of many candidates, with a mean score of three out of four, and full marks for almost half the entry.
- Q11** Only the better candidates made progress with this more challenging algebraic indices question.
- Q12** The better candidates did well in finding the angle the space diagonal made with a side, with overall probably a better response than in previous years.
- Q13** This challenging final trigonometric problem gained full marks for an encouraging thirty percent of the candidates.

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