



GCSE EXAMINERS' REPORTS

**GCSE (NEW)
MATHEMATICS**

NOVEMBER 2020

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MATHEMATICS

GCSE (NEW)

November 2020

UNIT 1 FOUNDATION TIER

General Comments

The number of candidates sitting this paper was very much smaller than the number who would usually be sitting a November series of exams.

The questions were a fair test for Foundation Tier candidates though several were found to be very challenging.

Candidates were more confident with attempting questions at the beginning of the paper than those in the second half of the paper which were the questions common to the Intermediate Tier paper.

Comments on individual questions/sections

- Q.1 (a)** There were many good attempts at drawing an angle of 35° at A, gaining B1. However, some located the angle randomly on the given line or read the wrong side of the protractor scale and drew an angle of 145° . Occasionally, the candidate marked the correct point using their protractor but forgot to join that point to A. In all these cases, B0 was awarded.
- (b)** A significant number of candidates did not seem to have a pair of compasses so were unable to draw an accurate circle, ending up with a wobbly attempt at a freehand drawing. If this attempt all lay within the allowed radius of $7\text{ cm} \pm 2\text{ mm}$, then B1 was awarded. However, many did not attempt this question at all, whether through the lack of a pair of compasses or not understanding that a circle with a diameter of 14 cm must have a radius of 7 cm. Several circles were seen with a much smaller radius than 7 cm.
- Q.2 (a)** This was answered well.
- (b)** Very many candidates still find a subtraction calculation difficult. If the question is written as a sentence, then not all candidates know how to change it to a calculation. They do not know which number to place on top, and which underneath. Whether written correctly or not, there were many candidates who subtracted the smaller digit from the larger in each column, irrespective of whether this digit was in the upper or the lower number.
- (c)** The most successful candidates halved 300 and then subsequently halved 150 to find one quarter of 300.
- (d)** Many candidates misunderstood what the question was saying, as very many candidates worked out $6 \div 2 = 3$ as their final answer, instead of working out $6 \times 7 \div 2 = 21$.
- Q.3** Both (a) and (b) were answered very well.

- Q.4** (a) The letter in the list which has exactly one line of symmetry was D. However, very many candidates wrongly thought that H had one line of symmetry and O to a lesser extent.
- (b) Candidates found this part, a question about rotational symmetry, easier to answer than (a).
- Q.5** (a) A very common error was writing 11 in the box instead of 9.
- (b) A frequent wrong answer was reversing the operations in the correct answer of $18 \div 6 - 2 = 1$.
- Q.6** (a) Many candidates found the correct answer of 53. They readily recognised that 6 needed to be added to the previous number.
- (b) In this sequence, the next number was found by halving the previous number. Halving 250 was difficult for many candidates.
- Q.7** (a) The most common errors were giving the answer as 14% as 14 squares were shaded or stating that 75% had been shaded as it looked as if about three quarters of the diagram had been shaded. Candidates should always carefully count how many squares are shaded as well as the total number of squares.
- (b) The circle has been divided into 16 equal sectors so 6 sectors need to be shaded to cover $\frac{3}{8}$ of the diagram. Many candidates wrongly shaded half the circle or just three sectors.
- Q.8** Many candidates were awarded one mark out of the available three marks for finding a pair of angles which added up to 180° . Common answers were 70° and 110° which were the measured angles in the diagram. However, these candidates had not dealt with the fact that one angle is twice the size of the other angle. Finding $\frac{1}{3}$ of $180^\circ = 60^\circ$ gave one angle and doubling that gave the other angle. These answers were seen but not very frequently.
- Q.9** (a) This question about collecting like terms was answered better than in previous exam series, probably because the first two terms were $9g - 5g$ which were easily combined as $4g$. Then $4g + 12g = 16g$. However, some did not include the letter g in their working or answer at all.
- (b) Candidates who knew that writing the answer to the equation as $y = 9$ were guaranteed the mark for this question. However, many worked out that the value of y is 9 but couldn't write their answer in an acceptable way. The following gained 1 mark:
 $5 \times 9 = 45$; $y = \times 9$; 5×9 ; 9 ;
 But answers like $45 \div 5 = 9$ followed by $9y$ were awarded B0.
- (c) Again, in this question, a substituted correct answer was acceptable for B1. So, $30 - 16 = 14$ gained B1. Ideally, the answer should be written as $w = 30$. However, many candidates wrongly thought that the value of w was 2 from $16 - 14$ or -2 from $14 - 16$.

- Q.9 (d)** This was a challenging question for most candidates. Many made up their own rules for algebra; e.g. $4x + 7 = 11x$, or they thought that $4x$ meant $4 - x$.

A significant number tried to use a flow diagram method for solving the equation but then most didn't know how to proceed when they had arrived at $3 \div 4$ using the inverse operations. They couldn't write down their final answer as $\frac{3}{4}$.

It was unusual to see an attempt at a standard, algebraic method. Of those, most could reach $4x = 3$. But many could not continue to the final, correct answer.

- Q.10** This was a challenging question for many. Some did realise that the numbers in the left-hand circle were factors of 16, but 32 was offered as well as an acceptable answer. Some mistakenly labelled the right-hand circle as multiples of 2 rather than the correct 4.
- Q.11** This was another difficult question for some candidates. Many didn't realise that just writing the median, 13, in the central box wasn't sufficient to make it the median. It had to be numerically the middle number of the three offered numbers. So an answer of 5, 13, 10 gained no marks as the range is not 5 nor is the median 13. But 5 13 15 gained B1 B0 for a correct median but wrong range.
- Q.12** In this question, it was particularly important to read all the words carefully. The four small rectangles were joined together by the **short** sides of the rectangles to make a long rectangle 28 cm by 3 cm. Many wrongly joined them by the long sides and so lost at least one mark. The last sentence in the question gave the instruction to draw a diagram of the long rectangle. It was hoped that this would help candidates visualise the large rectangle and consequently be able to answer the question more easily. However, many did not attempt a drawing. Maybe it was thought that a rectangle 28 cm would barely fit on the page and so couldn't be drawn. However, the question did not tell them to draw an **accurate** diagram.

There is still confusion between perimeter and area.

This is the OCW question. To be awarded the Organisation and Communication mark, candidates needed to use words to describe what they were finding. This does not mean a long description but if, for example, they did a calculation to find the length of the long side of the large rectangle, then a statement similar to the following should be included:

Length of long side = 4×7 cm.

For OC1, there also should be a conclusion like:

Perimeter = 62 cm.

For the Accuracy of Writing mark to be awarded, correct units must be seen at least once and preferably in the answer. Also, there must not be any poor mathematical form, like $4 \times 7 = 28 + 28 = 56 + 3 = 59 + 3 = 62$.

Working similar to the line above immediately gets W0.

But full, correct working does need to be seen, showing the calculations necessary to work out the perimeter.

- Q.13 (a)** The answer to this question about time was either 20:18 or 8:18 p.m. Very many candidates worked out the correct numbers, 8:18, but left the answer without the p.m. Consequently, the mark for the question could not be awarded as 8:18 alone is 8:18 a.m.

- 13 (b)** Though most candidates attempted this question, very many candidates found it difficult to work out the difference between two times which were on opposite sides of 12 noon. There was a variety of wrong answers, of which 7 hours and a random number of minutes was very popular.
- (c)** This again proved challenging. The most successful method involved changing both times to seconds (7 mins 15 secs = $7 \times 60 + 15 = 435$ secs and 2 mins 50 secs = 170 secs). This gained 1 mark. Unfortunately, some who reached there were unable to subtract 170 from 435 correctly.
- Q.14 (a)** The line $x = -4$ was rarely drawn correctly. Sometimes, both $y = -4$ and $x = -4$ were drawn but were not labelled so it was impossible to know if the candidate knew which was which and so no credit could be given. Also, the point $(-4, -4)$ was another frequent wrong answer.
- (b) (i)** The point C was often marked somewhere on the line $x = -2$, which gained 1 mark. However, it was more frequently wrongly marked at the point $(-2, 7)$ instead of at the correct $(-2, -4)$.
- (c) (ii)** This mark was allowed for a correct follow-through from a wrongly marked point C. This part was well answered.
- Q.15 (a)** A common mistake was writing 3^3 as $3 \times 3 = 9$ and 10^2 as $10 \times 2 = 20$. Other errors included $3^3 \times 10^2 = 30^5$ or 30^6 . Sight of either 27 or 100 gained 1 mark, and $27 \times 100 = 270$ was a common error which wasn't awarded the second mark.
- (b)** The correct answer of 0.08 was very rarely seen. Overwhelmingly, the number 0.8 was wrongly given as the answer.
- (c)** There were very few correct answers to $\frac{4}{9} + \frac{5}{18}$. The most common answer was $\frac{9}{27}$ but some did know how to find the correct denominator and add the numerators.
Some followed $\frac{9}{27}$ by $9 + 27 = 36$.
- Q.16** There was some difficulty in finding the number of students for each sector from the proportion indicated by the angles on the pie chart. The easiest method was to realise that if the total number of students was 300, then the half of them answering 'Yes' totals 150. The number answering 'Not Sure' is twice the number answering 'No', so it was necessary to work out $\frac{2}{3}$ of the remaining 150 for 'Not Sure' and $\frac{1}{3}$ for 'No'. There were numerous different incorrect trios of numbers but 1 mark could be gained for various reasons, e.g. if their number for 'Not Sure' = $2 \times$ their number for 'No'.
- Q.17** The values for a , b and c were found from parallel line facts. Even if the answer for a was wrong, there were follow-through marks for b and c . Consequently, candidates were able to gather marks despite an initial mistake.

- Q.18** Very many candidates knew that they needed to add together the probabilities given in the table, i.e. work out $0.4 + 0.15 + 0.25$. However, most used 0.04 in their calculation instead of 0.4, reaching an answer of 0.44 instead of 0.8. This needed to be subtracted from 1 and should have given an answer of 0.2 which would have been easier to use in the second part of the question. However, very many candidates subtracted their wrong answer of 0.44 from 1, getting 0.56 at which point they stopped. Trying to find the number of cards showing a picture of Puffin Island, very many just subtracted 44 from 80 instead of multiplying their probability by 80.
- Q.19** (a) This appeared to be an unfamiliar topic to almost all candidates. There were only a very, very few attempts at drawing arcs centred at A and C, the point of intersection of which gave the fourth vertex of the parallelogram. Several candidates did try to complete the diagram by drawing lines parallel to the given lines but no marks were awarded for these.
- (b) Most candidates did not know what to do with the scale 1:200. To be awarded even the first mark, they had to multiply their measurement of the length of XY by 200. Very few did that, even if they had measured XY correctly. This should give a measurement in cm which had to be converted to metres. However, this last stage of answering the question was seen very rarely.
- Q.20** (a) Candidates found this part much easier to do than (b) and (c). Approximating 5.43 to 5 and 1.7 to 2, made choosing the correct answer to 5.43×1.7 straightforward to do.
- (b) As this question involved a quotient, candidates found it much more challenging and appeared to choose an answer at random. There was little evidence of working to support their choice.
- (c) This part was even more difficult for candidates than (b). Again, guesswork seemed to inform their decision as to which of the five possibilities was the correct answer.

Summary of key points

- Every word in a question must be read to avoid missing key parts.
- Subtraction calculations: many still find it difficult to interpret questions which are expressed in words. Both the setting out and calculation of the resulting sum need practice.
- Adding decimals: ensure that the decimal points are lined up.
- The difference between perimeter and area needs to be emphasised.
- Setting out the solutions to equations clearly.
- Definitions of mathematical terms should be secure; e.g. factor and multiple.

MATHEMATICS

GCSE (NEW)

November 2020

UNIT 1 INTERMEDIATE TIER

General Comments

The number of candidates entered was significantly lower than for any previous November series.

Overall the paper was comparable with the previous papers that have been sat and was a suitable and fair test for the candidates at the Intermediate level. A number of candidates were unfamiliar with the whole of the specification to be tested at this level.

A few questions were very accessible but it appeared that many of the candidates found several questions to be more challenging than was expected.

Candidates performed particularly poorly on the latter part of the paper which had common questions with the Higher tier paper.

Topics which many found difficult included questions involving the standard units of time, constructions, Venn diagram notation, factorisation of a quadratic expression, expansion of linear expressions, angle and tangent properties of circles and also understanding of how a straight line is represented in the form $y = mx + c$.

Comments on individual questions/sections

- Q.1** Candidates find it difficult to handle evaluations involving the standard units of time. All three parts of this first question were individual calculations and not part of a solution to wider problems regarding timetables etc.
- Q.1 (a)** The time 8 hours and 40 minutes after 11:38 is 20:18 (or 8:18p.m.). As it was a one mark question, there was no part mark available for an incorrect answer of 8:18 a.m. or simply 8:18. Weaker candidates still persist in treating time as a decimal value and the answer of $11.38 + 8.40 = 19.78$ was often seen.
- (b)** The three most common incorrect answers given were, 5 hours and 20 minutes from using ' $7 \cdot 35 - 2 \cdot 15 = 5 \cdot 20$ ', or 7 hours and 20 minutes from using '7 a.m. to 2 p.m. = 7 hours plus 35 – 15, or 7 hours and 40 minutes from using '7 a.m. to 2 p.m. = 7 hours plus 60 – 35 + 15'.

- Q.1 (c)** The most successful approach was to convert both times into seconds, giving $435 - 170 = 265$ seconds.
A common error was to find the difference in minutes and converting to seconds as $(7 - 2) \times 60 = 300$ followed by the difference in seconds $50 - 15 = 35$, but then, mistakenly adding these values as 335, instead of correctly subtracting to give the correct answer of 265 seconds.
- Q.2 (a)** The line $y = -4$ was often drawn instead of the line $x = -4$.
- (b) (i)** Although not required, the line AC was often drawn. This was helpful as some of those candidates who simply indicated the point C were more likely to make an error. Drawing a square without indicating which vertex was point C, did not gain full marks.
- (b) (ii)** Candidates were allowed to follow through on any unambiguously identified position of point C shown in (i). Most gave the correct coordinates although a few reversed the x and y values. Candidates should be encouraged to give their answer as eg $(-2, -4)$ and not as $x = -2, y = -4$.
- Q.3 (a) (i)** Well answered.
Worth noting that an incorrect answer of $27 + 100 = 127$ would have gained a mark for the sight of 27 (or 100) but an unsupported answer of 127 would not gain any marks.
- (ii)** As expected a number of candidates gave the answer as 0.8 instead of 0.08.
- (iii)** Disappointing that so many candidates still think that $4/9 + 5/18 = 9/27$.
- (b)** A misunderstanding of what is meant by 'correct to 1 significant figure' led to the following examples of incorrect answers; 0.04, 0.0500 and also simply writing 0 as their answer.
- Q.4** The mark scheme allowed for a number of ways in which part marks could be gained following one error.
Most candidates realised that the number answering 'Yes' was 150.
Of those who only gained one of the remaining two marks it was mainly because they had the 'No' and 'Not sure' adding up to 150.
- Q.5 (a)** Most of the candidates correctly found x to be $\frac{3}{4}$ (many expressing it as a decimal).
An embedded answer of 0.75 was given credit as long as not then contradicted.
Embedded answers should not be encouraged, as in this question more than one candidate wrote, ' $4 \times 0.75 + 7 = 10$ ' followed by ' $x = 10$ '.
- (b)** To gain full marks the final answer had to be the expression $5d - 2e$.
A mark was sometimes lost as the candidate had either, shown the 5d and $-2e$ as separate entities, or had expressed $5d - 2e$ as 3de.

- Q.6** Candidates could use their knowledge of alternate and/or corresponding angles along with angles on a straight line and/or opposite angles at a vertex. The mark scheme was set up so that marks could be, and were, awarded for a correct follow through from a previous incorrect value.
- Q.7** Many candidates did not appreciate that it had to be the corresponding sides of the two congruent triangles that were equal in length. Several thought that side AB was equal to side MK as both were drawn as horizontal lines.
- Q.8** Candidates should be made aware of what is taken into consideration when awarding the OC and W mark. Responses should be structured with explanations that are clear and logical to the reader. A solution such as 'Puffin = 0.2, 20% of 80 = 16' does not explain to the reader what is being calculated at each stage. Explanations should be given at the point in the solution when they are presented (not a series of calculations followed at the bottom of the page with a detailed explanation). Correct mathematical form is required. We do not want to see, for example, 'Probability = $0.4 + 0.15 + 0.25 = 0.8 - 1 = 0.2$ '.
- A number of candidates did not go further than finding the probability of choosing a card showing Puffin Island to be 0.2. They did not engage fully with the question and so were not awarded either of the OCW marks.
- Q.9** (a) This is a topic that many find difficult. Very few candidates constructed accurate drawings using only a ruler and a pair of compasses. There were lots of 'fake arcs' (some even intersecting at the vertex D).
- (b) Candidates were required to show their understanding of a scale being written in the form 1 : 200 as well as conversion from centimetres to metres. Accuracy in measuring the given line was only rewarded once a correct method had been demonstrated.
- Q.10** (a)(b) and (c) Multiple choice questions to test candidates' knowledge of place value. Most of the choices of answers made, demonstrated a lack of 'feel' for number calculations. On reflection I'm sure that those who thought that 5.43×1.7 was equal to 923.1 would agree that 9.231 is closer to an approximation of 5.5×2 !
- Q.11** (a) The common incorrect answer was $n + 5$. Some candidates were careless in losing a mark for writing $5n + 3$ instead of $5n - 3$.
- (b) Not many correct answers. It was only worth 1 mark so not a disaster in that respect BUT, the loss of examination time spent on this question, judging by the amount of drawings and calculations seen on some scripts, could have been crucial.
- (c) Few candidates were able to recognise how the diagram number related to the number of dots shown.

- Q.12 (a)(i) and (ii)** Candidates at the Intermediate and Higher tiers should be familiar with set notation. On both parts of this question only a handful of candidates were able to show the correct shading.
- (b)** A valid and relevant statement of why the circle representing Set C (multiples of 6) is drawn inside the circle representing Set A (multiples of 3) was required. The mark was not awarded if the statement was not precise enough through use of words such as e.g. 'some multiples', 'many of the multiples', 'lots of the multiples' etc.
Several candidates gave the reverse incorrect statement that 'multiples of 3 are also multiples of 6'.
- Q.13** The common error was to divide £210 by 14 instead of by 3.
- Q.14 (a)** Calculating the correct value for y when substituting $x = -2$ into the quadratic proved difficult for many of the candidates. A common error was to evaluate $-2^2 = -4$ instead of $(-2)^2 = 4$.
- (b)** Most plotted their points accurately. There has been an improvement in the drawing of a smooth curve although some candidates lost a mark as not enough care had been taken in making sure the curve went through all of their plotted points within the permitted tolerance.
- (c)** The question asked for the line $y = 1$ to be drawn. In cases where this line had not been drawn then a mark was lost regardless of whether the correct values of x were given. The negative value of one of the points of interception was sometimes overlooked, resulting in an unnecessary loss of a mark. Another error often seen was to misread the negative scale on the x-axis and give an answer of -1.2 when it should have been -0.8 .
- Q.15** In this type of question the candidates should unambiguously record their answer in the boxes. An answer 'hidden' on a page full of work on different attempts, unless clearly identified as the final answer, cannot be credited.
Some lost a mark for not keeping to the instruction that four different positive whole numbers were required.
- Q.16 (a)** The few who managed to factorise, did then proceed to solve the quadratic correctly. Many tried to solve by 'trial and improvement'. None were successful as they did not realise that there were two solutions.
- (b)** Very poorly answered with most candidates simply attempting to square just the two terms seen in the bracket.
- Q.17 (a)** A slightly different question involving a tree diagram in that the candidates were asked to draw and fully label their own diagram.
Most succeeded in drawing a correct framework with suitable labelling. They also managed to give the correct probabilities on each of the relevant branches.
Not all were as neatly presented as one would wish.
- (b)** Some candidates are still not sure on how to deal with independent events. More of a worry is the fact that they seem unconcerned with an answer for a probability that is greater than 1 (e.g. $0.7 + 0.4 = 1.1$).

- Q.18 (a)** The mark was awarded for explaining which circle theorem was used to give the answer that $PA = 12$ cm. Whilst one would hope to see 'tangents to a circle from an external point are equal in length' written in full, a mark was given if the crucial words 'tangents' and 'equal (identical / same)' were used in their explanation.
Very few correct explanations were seen.
- (b)** The mark was awarded for explaining which circle theorem was used to give the answer that $\hat{PAO} = 90^\circ$. Whilst one would hope to see 'the tangent at any point on a circle is perpendicular to the radius at that point' written in full, a mark was given if the crucial words 'tangent' and 'radius (diameter)' were used in their explanation.
Very few correct explanations were seen.
- (c)** Those who recognised that the quadrilateral PAOB was made up of two identical right-angled triangles were able to give the correct area.
- Q.19 (a)(b) and (c)** Multiple choice questions to test candidates knowledge of the use of the form $y = mx + c$ to represent a straight line.
The inaccurate choices made in all three parts of the question shows an extremely poor understanding of what the 'm' and the 'c' represent in the above equation.

Summary of key points

- Practise dealing with questions involving 'Time' (adding times, finding difference between times etc.).
- Construction using only a ruler and a pair of compasses is still a challenge to many of the candidates.
- Where possible use estimations to check whether an answer is reasonable.
- Familiarise the candidates with set notation.
- Candidates should use the correct wording when describing theorems.
- Form a greater understanding of what the 'm' and the 'c' represent in $y = mx + c$.

MATHEMATICS
GCSE (NEW)
November 2020
UNIT 1 HIGHER TIER

General Comments

As expected, candidates' performances reflected the increased demand as they progressed through the paper. Failure to attempt a question was extremely rare, indicating that candidates had been appropriately entered for this tier. It is notable that this was by far the lowest number of entries since this specification was first examined in 2016. There were plenty of excellent performances across the whole paper, however some specific topics did prove to be challenging. Topics which caused particular difficulty: circle theorems; straight line graphs; algebraic manipulation; formal geometric proof; understanding the behaviour of irrational numbers.

Comments on individual questions/sections

- Q.1**
- (a)** The vast majority of candidates earned both marks here, with many of the others gaining a single mark for an expression containing $5n$.
 - (b)** Plenty gained the mark here from looking at the differences between consecutive diagrams. However, some candidates did a lot of unnecessary work in listing the numbers of circles in all the diagrams, up to and including the 17th, with a few even drawing all of the diagrams.
 - (c)** Candidates who engaged with the spatial arrangements were usually successful here. Others succeeded by listing the numbers of dots (4, 6, 8,) as a route to producing the n^{th} term.
- Q.2**
- (a)**
 - (i)** A good number did understand the notation $A \cup B$, but a significant proportion shaded the intersection ($A \cap B$) of the sets in the diagram, rather than the union.
 - (ii)** This part caused notable difficulty, with a huge variety of different parts of the diagram being shaded. Notably, shading $A \cap B$ was a very common incorrect answer.
 - (b)** There were plenty of clear statements that 'a multiple of 6 is always a multiple of 3', though some unfortunately reversed the '3' and '6'. Other statements were too vague e.g. 'a multiple of 3 could be a multiple of 6'.
- Q.3**
- (a)** This question on a quadratic graph was done well. Calculating the missing values in the table was almost always done correctly, which helped in plotting points and sketching the quadratic graph.
 - (b)** Many excellent graphs were seen. However, if coordinates were incorrect in part (a), some candidates did not seem to appreciate the need to revisit their calculation in order to produce a smooth parabola. In drawing a 'curve', marks were occasionally lost for joining all of the points with straight lines.

- Q.3 (c)** The majority were able to draw the line with equation $y = 1$, and did so clearly. Most then took correct readings of the x coordinate at the appropriate points of intersection. Even having drawn the correct line for $y = 1$, some took their readings from the intersection of the parabola with the x axis. There were occasional mis-readings of the negative x value, with two small squares to the right of -1 being given as -1.2 instead of -0.8 .
- Q.4** This question on ratios proved accessible to the majority, with the correct final answer of £980 very frequently obtained. A few candidates misunderstood the given information that 'the smallest share' (of 3 parts of the ratio) was £210, with some using £210 either as the total or as 1 part. For the OCW requirement, most candidates understood the necessity of labelling their steps e.g. '1 part =' or 'total ='. Given that this was an OCW question about money, it was a pity that a small number did not use a '£' sign at all within their solution. There was occasional misuse of ratio notation, with '3' being replaced by 210 within 3:4:7. Some gave statements such as '1=70' (rather than '1 part =70'); in this case, this was considered to be an instance of 'mis-labelling' rather than a mis-use of the '=' sign. A mis-use of the '=' sign did occasionally arise within number work (e.g. '210/3=70×4=280'). Some candidates continue to write extensive - and unnecessary - worded descriptions of each calculation and should aim to be more concise. In particular, a few wrote all their calculations, arrived at a final answer, and then wrote retrospectively about their work (others did the reverse); this is not the intention in terms of OCW. The explanations of a step should accompany the relevant calculation.
- Q.5** Good understanding of mean, range and median was shown here. Some candidates appeared to miss the requirement to find different numbers, often repeating the number 8 within their list.
- Q.6 (a)** Secure basic algebra skills were evident. Most candidates knew how to factorise the quadratic expression, and hence solve the equation. A few made sign errors; others attempted to use the quadratic formula, despite the clear instruction to factorise.
- (b)** The majority produced four terms in expanding the brackets, however a surprising number failed to square $5x$ correctly, with common wrong answers including $25x$ or $10x^2$.
- Q.7 (a)** Probability questions involving tree diagrams have been extremely well-answered in recent examination series. This time there was an added requirement to construct the diagram from scratch rather than using a printed template. This did not prove to be an obstacle. Excellent diagrams were seen, usually including full labelling and correct probabilities.
- (b)** This was also very well done, with only a very few adding rather than multiplying the relevant probabilities.
- Q.8 (a)+(b)** Although there were good responses, too many lost marks here for poorly expressing the two circle theorems, often omitting crucial terms such as 'tangent' and 'radius'.

- Q.8 (c)** Many gained both marks here. This was usually done by calculating the area of one of the triangles and doubling the answer. Some realised that the triangles could be neatly re-arranged as a rectangle, shown by drawing a sketch before calculating the area.
- Q.9** There was a mixed response to this question on graphs of straight lines, and it was relatively rare for a candidate to gain all three marks. As in previous multiple choice questions, those who undertook written workings rather than just selecting an answer tended to do best.
- Q.10 (a)** Plenty of candidates produced the correct formula for t in terms of g . However, some were penalised for stopping after finding the constant of proportionality (without going on to state the required formula). Very few candidates tried to use direct rather than inverse proportionality.
- Q.10 (b)** Most knew to substitute the value 20 for g in their formula.
- (c)** Again, most knew to substitute the value 40 for t in their formula. However, many were caught out by the need to round down in order to obtain the final answer which was appropriate within the context.
- Q.11** Part (a) proved to be more accessible than part (b) here. Again, those who attempted related written work tended to be most successful, especially in part (b).
- Q.12** There were an encouraging number of excellent responses here. However, sign errors were too commonly made in expanding the brackets in the numerator. A significant minority unfortunately had very little idea of how to start working with the algebraic fractions.
- Q.13** A high proportion of candidates showed a thorough understanding of scale factors in different dimensions, but too many used 64 as a linear scale factor instead of recognising the need to cube root it first.
- Q.4 (a)** Most knew how to convert the recurring decimal into a fraction.
- (b)** Candidates were usually able to simplify the surd and select the correct answer.
- Q.14 (c)** There appeared to be some improvement in manipulating surds, with a high proportion gaining both marks here. There were still fundamental errors made, such as writing $7\sqrt{5}$ as $\sqrt{35}$. Some lost the final mark for stating that $11+\sqrt{5}$ (or $11+1\sqrt{5}$) became $11\sqrt{5}$ (or $12\sqrt{5}$).
- Q.15** There were some good solutions seen, but the majority experienced difficulty with the requirement for a formal proof. Candidates needed to use the information given in the question rather than making unjustified assumptions about sides or angles. (In particular, many assumed the whole triangle to be isosceles.) There was often a lack of appropriate notation for naming sides or angles (e.g. 'angle G' rather than 'angle EGF'); markings on the diagram were insufficient. Whilst many knew that they needed to refer to a specific case of congruence, candidates should be aware that stating 'two sides and an angle' is unsatisfactory without making clear that the angle is 'included'.

- Q.16** In order to make y the subject, the first step required both sides of the given equation to be squared. Many candidates did realise this, but some then lost a mark for incorrectly giving $(2y)^2$ as $2y^2$. It was a concern that a significant number were unable to access the question due to thinking that $\sqrt{3+my^2}$ could be re-written as $\sqrt{3} + \sqrt{my^2}$.
- Q.17** Many were successful here but some were penalised for poor use of notation, including ambiguous use (or lack) of brackets.
- Q.18** This question was most easily answered by expressing x in terms of π and r , then basing a brief explanation on irrational numbers. However, many candidates offered alternative valid reasoning based on square numbers or decimals. Relatively few gained both of the available marks, often penalised because they incorrectly stated that a (terminating) decimal (namely 3.14) multiplied by an integer could not then be an integer. Others failed to gain credit because they only considered a specific case, by assigning a value to either x or r .
- Q.19 (a) and (b)** These were usually well done, with only a few attempting to add fractions inappropriately or failing to account for non-replacement.
- (c)** This part of the question was more challenging, with candidates often losing marks for failing to account for different possible orderings of colours.

Summary of key points

Candidates should:

- develop a fluent understanding of set notation and of related visual representations;
- avoid unnecessary (or inappropriately positioned) extended writing in an OCW question
- expect to be required to formally write down circle theorems, and learn to do so fully;
- know how to obtain the appropriate form of the equation of a straight line in order to identify the gradient and y -intercept;
- practise manipulating algebraic fractions;
- know how to set out a formal proof in geometry, including appropriate notation;
- understand that, in general, the square root of the sum of two different numbers does not equal the sum of the square roots of the two numbers [$\sqrt{a + b} \neq \sqrt{a} + \sqrt{b}$];
- know that π is an infinite decimal, and that any multiple of it is irrational.

MATHEMATICS

GCSE (NEW)

November 2020

UNIT 2 FOUNDATION TIER

General Comments

The number of candidates entered was significantly lower than for any previous series of this paper.

Overall, the paper was comparable with the previous papers that have been sat and was a suitable and fair test for the candidates at the Foundation level. A number of questions were very accessible, especially those at the start of the paper.

A number of candidates were unfamiliar with the whole of the specification to be tested at this level, particularly those topics which are common with the Intermediate tier.

Topics which many candidates found difficult included questions involving rotational symmetry, solving two-step equations, Venn diagrams and calculating the area of a circle.

Comments on individual questions/sections

- Q.1** This question was both well attempted and well answered by candidates. Those candidates who lost marks on this question, typically did so because they carried out their calculations without a calculator – it was common to see workings at the bottom of the page. Some candidates made place value errors in this question, especially for the final calculation.
- Q.2** (a) This part was answered correctly by approximately half of the candidates. Incorrect responses typically included just three or four zeros.
- (b) This part was answered correctly by less than a quarter of the candidates. Most candidates engaged with the requirement that their answer needed to be even. However, the incorrect answer of 8888 was seen far more often than the correct answer, 9998.
- (c) It seemed that fewer candidates confused multiples with factors than in previous series. Lots of candidates were awarded only 1 out of the 2 marks because they omitted one of the four required factors – typically either 1 or 15.
- Q.3** (a) Multiple-choice question. This part was answered correctly by just under three-quarters of candidates.
- (b) This was answered correctly by less than a quarter of candidates. The most common incorrect answer was 10.
- (c) Multiple-choice question on chance. This was answered correctly by less than half of the candidates.

- Q.4** (a) Candidates typically had either 2 marks or 0 marks for this part. Most incorrect responses had four lines of symmetry drawn – the required vertical and horizontal lines, with two diagonal lines incorrectly included too.
- (b) This part was answered correctly by over a quarter of candidates. Some candidates wrote other types of triangle, typically isosceles or scalene, instead of the correct answer of equilateral, whilst some simply wrote triangle or square.
- Q.5** (a) This part was answered correctly by over half of the candidates. Some candidates showed an awareness of obtuse angles but used numbers other than 0, 1 and 2 to form their angle.
- (b) This part was answered less well than 5(a). Most incorrect answers were typically acute or obtuse angles.
- Q.6** Candidates who realised that the three numbers needed to sum to 24 in order for the mean to be 8, typically gained 2 or 3 marks. Candidates who were awarded 2 marks typically ignored the condition that the numbers all needed to be even, or that 8 could not be one of the numbers.
- Q.7** (a) This part assessed calculator use and was answered correctly by less than half of the candidates.
- (b) Approximately a half of candidates could correctly calculate the fraction of an amount. Very few candidates were aware of the method but were unable to carry out the calculation accurately.
- (c) Approximately half of the candidates answered this part correctly. Common incorrect answers were 2.6 and 1.6.
- Q.8** This question required candidates to be able to convert between fractions, decimals, and percentages. Candidates were most successful at writing 0.3 as a fraction. They found it much more challenging to write 0.45 as a fraction where the denominator of 20 was already given to them.

Q.9 OCW question.

There were 3 marks available in this question for finding the volume of Ivy's cuboid, along with the OC and W marks.

It was very unusual to see a fully correct answer. Some candidates were awarded 1 mark for finding the dimensions of Ivy's cuboid, but many weren't sure what to do with the length, width and height which they had calculated. Some candidates added these values, whilst others didn't go any further than finding the dimensions.

Some candidates wrote an extensive narrative for this question, with some writing so much that it was difficult to see exactly what they were doing. It was very unusual to see the correct units (cm^3) given with candidates' final answer, with cm^2 frequently seen.

- Q.10** (a) (i) Nearly a quarter of candidates did not attempt this part. Most of the candidates who attempted it were correct. This part tested the candidates' ability to correctly use their calculators, rather than any knowledge of using a reciprocal.
- (ii) This part was well answered by candidates, although some ignored the instruction to give their answer correct to the nearest 10.
- (b) A quarter of candidates did not attempt this part. Despite this question being on the 'calculator allowed' unit, candidates often attempted to use non-calculator methods, such as the partitioning method. Those who used these methods were much more likely to make an arithmetical error than those who simply used the calculator to evaluate 0.62×7.8 or $62\% \times 7.8$. The correct answer of 4.836, once seen, gained both marks. However, some candidates did not show any workings - an unsupported answer of 4.8 was awarded one mark, as it implied a correct method, but the answer was not given to an appropriate level of accuracy.
- (c) (i) and (ii) Multiple-choice questions. Candidates had twice as much success in recognising the correct multiple of 19 in part (i) as they did in finding the cube number in part (ii).
- Q11** (a) This was very well answered. Nearly all of the candidates wrote down the correct missing two numbers in the continuation of the sequence.
- (b) Over a quarter of candidates did not attempt this part. Some candidates evaluated 4×7.2 and 3×-4.6 correctly but then made the error of adding 28.8 and 13.8 to give an incorrect answer of 42.6.

- Q.12** Candidates found this question particularly challenging. It was common to see candidates simply adding three lots of 17.5 on or beneath the diagram. Both methods noted in the marking scheme were used by those candidates who showed understanding of the problem that needed to be solved, It was very unusual to award all four marks to candidates. Those candidates who evaluated $400/17.5 = 22.8\dots$, often gave an incorrect final answer of 23, thinking they had to round their answer to the nearest whole number. Those who calculated $22 \times 17.5 (=385)$ and $23 \times 17.5 (=402.5)$ typically gave an incorrect final answer of 23 because 402.5 is closer to 400 than 385.
- Q.13** (a) This part was well attempted but very poorly answered. The common incorrect response was to reflect the two shapes in the x-axis.
- (b) This part was very poorly answered by candidates. One of the two marks was for noting that the shape had been reflected. It was common to see unacceptable definitions offered, such as 'mirrored' or 'flipped'. The second mark was for identifying the line $x = 5$. This was very rarely seen in candidates' responses.
- Q.14** (a) Very few candidates could solve this two-step equation. Most of the candidates who were awarded full marks for this part used an informal method to work out that $x = 0.5$. Some candidates started off by expanding the bracket to give ' $10x + 15 = 20$ ', but very few could go any further. An embedded answer of 0.5 was given credit as long as not then contradicted.
- (b) Over a third of candidates did not attempt this part. It was exceedingly rare to award both marks for this part. The common error was to leave out the brackets in their final expression, giving their answer as $n - 3 \times 5$. This was awarded one mark if not then incorrectly simplified, e.g. to $15n$.
- Q.15** (a) This part was very well attempted but very poorly answered, with nearly all candidates answering the part incorrectly. A vast majority of candidates indicated 'No'. For those who indicated 'Yes', a valid and relevant explanation was required. The explanation had to engage with the specific triangle described in the question and not a reference to a general isosceles triangle. To gain the mark, candidates had to indicate that the other two angles could both be 20° .
- (b) A multiple-choice question. Even if the candidates were unfamiliar with the fact that the exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices (as stated in the specification), those candidates who opted for choosing ' $a + b = 210$ ' as their answer should have considered that the sum of the three angles of a triangle is only 180° !

- Q.16** Candidates answered this question more successfully than most of the other questions which were common with the Intermediate paper. Many of the candidates gained one out of the two marks. Few candidates showed that $n(G \cap S) = 10$, but many correctly indicated that $n(S) = 13$.
- Q.17** This question, which was worth 5 marks, was not attempted by over 30% of candidates. Most of the candidates who gained marks in this question did so by indicating that the length of AD or BC was 10 cm. Some of these candidates were then able to calculate the area of ABCD, but that was typically it – very few could go any further. It was extremely rare for candidates to demonstrate knowledge of how to calculate the area of a circle – π was very infrequently seen in responses.

Summary of key points

- OCW questions require, in particular,
 - an explanation at each step of the response of what is being done,
 - a structured, clear and logical lay out,
 - that all workings and calculations are shown,
 - that correct mathematical form is used, and
 - that units, where appropriate, are always given.
- Calculators should be used to improve the accuracy of calculations.
- Calculator methods need to be practiced by candidates. Many candidates made errors whilst using non-calculator methods when carrying out calculations such as calculating the percentage of an amount.
- Algebraic topics, such as substitution and solving equations, need further attention.
- Candidates need to ensure that they learn all formulae outlined in the specification document, such as the formula to calculate the area of the circle.

MATHEMATICS

GCSE (NEW)

November 2020

UNIT 2 INTERMEDIATE TIER

General Comments

The number of candidates entered was significantly lower than for any previous November series.

Overall the paper was comparable with the previous papers that have been sat and was a suitable and fair test for the candidates at the Intermediate level. A number of candidates were unfamiliar with the whole of the specification to be tested at this level.

A number of questions were very accessible especially those in common with the Foundation tier.

Candidates did not do as well as expected on the questions that were common to both the Intermediate and Higher tier. This despite many of these questions being of a standard nature that have been asked in a similar style on previous examination papers. Topics which many found difficult included questions involving, calculation of an estimated mean, trigonometric relationships in a right-angled triangle, use of upper and lower bounds, solving simultaneous equations and angle properties of a circle.

Comments on individual questions/sections

- Q.1**
- (a)**
- (i)** Very well answered. A question that tested the ability to correctly use the facility of a calculator at an elementary level, rather than any knowledge of using a reciprocal.
- (ii)** Again well answered although a number of candidates ignored the instruction to give their answer correct to the nearest 10.
- (b)** Despite this question being on the 'calculator allowed' unit, several candidates used a non-calculator method. Those who did find $6 \times 10\% \text{ of } 7.8 + 2 \times 1\% \text{ of } 7.8$ were more likely to make an arithmetical error than those who simply used the calculator to evaluate 0.62×7.8 . The correct answer of 4.836, once seen, gained both marks. However an unsupported answer of 4.8 was only awarded one mark (implied correct method).
- (c)**
- (i) and (ii)** Multiple choice questions. Candidates had more success in recognising the correct multiple of 19 in part (i) than they did in finding the cube number in part (ii).
- Q.2**
- (a)** Nearly all of the candidates wrote down the correct missing two numbers in the continuation of the sequence.

- Q.2 (b)** A significant number of candidates having evaluated 4×7.2 and 3×-4.6 correctly then made the error of adding 28.8 and 13.8 to give the wrong answer of 42.6
- Q.3** Both methods noted in the mark scheme were used with equal success. The common misunderstanding, leading to the loss of the final mark, was the same whichever method had been used. Those who evaluated $400/17.5 = 22.8\dots$ gave an incorrect final answer of 23, thinking they had to round their answer to the nearest whole number. Those who calculated $22 \times 17.5 (=385)$ and $23 \times 17.5 (=402.5)$ gave an incorrect final answer of 23 because 402.5 is closer to 400 than 385.
- Q.4 (a)** Extremely well answered with only a few candidates not filling in **all** of the spaces with a label or an outcome.
- (b)** A few candidates took 'greater than 3' to include the 3, and so gave an answer of 3/15 rather than 2/15. Another misunderstanding seen on a few occasions was to ignore the number on the card aspect and simply state that the probability of choosing a pink card was 1/3.
- Q.5 (a)** The common incorrect answer was to reflect the two shapes in the bold central horizontal line. A few candidates who were intending to show rotational symmetry of order 2, unfortunately shaded in an extra square on the rectangular shape.
- (b)** One of the two marks was for noting that the shape had been reflected. The words 'reflection', 'reflected', even 'reflexion', all gained this mark. What was not acceptable was 'mirror image' or 'flipped'. A lot of these unacceptable definitions were seen. The second mark was for identifying the line $x = 5$ and not simply drawing the line on the grid. Again there were unacceptable offerings such as ' $x + 5$ ' and ' $5x$ '.
- Q.6 (a)** Around half of the candidates correctly found x to be $\frac{1}{2}$ or 0.5 and so gained all three marks. Most candidates started off by expanding the bracket to give ' $10x + 15 = 20$ '. Far fewer started off by dividing both sides of the equation to give ' $2x + 3 = 4$ '. A common error was to proceed from $10x = 5$ to give an answer of $x = 10/5 = 2$. An embedded answer of 0.5 was given credit as long as not then contradicted. Embedded answers should not be encouraged, as in this question more than one candidate wrote, ' $5(2 \times 0.5 + 3) = 20$ ' followed by ' $x = 20$ '.
- (b)** Some candidates did not seem aware of what was meant by 'factorise', and the expression was treated as an imaginary equation. The answer of $a = 3$ was often given by these candidates.
- Q.6 (c)** The common error was to leave out the brackets in their final expression, giving their answer as $n - 3 \times 5$.

- Q.7 (a)** A valid and relevant explanation was required. The explanation had to engage with the specific triangle described in the question and not a reference to a general isosceles triangle.
To gain the mark, candidates had to indicate that the other two angles could both be 20° .
- (b)** A valid and relevant explanation was required. The explanation had to engage with the fact that a rhombus has two pairs of equal angles.
This question was not well answered.
- (c)** A multiple choice question.
Even if they were unfamiliar with the fact that the exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices (as stated in the specification), those candidates who opted for choosing 'a + b = 210' as their answer should have considered that the sum of the three angles of a triangle is only 180° !
- Q.8** Well answered.
Not all of the candidates showed that $n(G \cap S) = 10$, but nearly all of them correctly indicated that $n(S) = 13$.
A common incorrect answer was to show $n(G \cap S)$ as being equal to 9. This may have something to do with the fact that these candidates thought that the $1/3$ given in the question meant that a multiple of 3 was required in this part of the Venn diagram.
- Q.9** Candidates should be made aware of what is taken into consideration when awarding the OC and W mark.
Responses should be structured with explanations that are clear and logical to the reader.
A solution such as 'Area = 50 cm^2 , Area = $(\pi \times 5^2) \div 4$, and so Area = 30.3 cm^2 ' does not explain to the reader what is being calculated at each stage. Explanations should be given at the point in the solution when they are presented (not a series of calculations followed with a detailed explanation at the bottom of the page).
Correct mathematical form is required.
We do not want to see, for example, 'Area ABP = $\pi \times 5^2 = 78.5 = 78.5 / 4 = 19.6$ '.
As this question was asking for an area then the answer should display the correct units.
- 10 (a)** Not well answered with many candidates simply writing down the two relevant probabilities as $1/6$ and $1/4$ but not proceeding to evaluate $1/6 \times 1/4$.
Many of the candidates did not know how find the probability of two independent events both happening.
- (b)** A better understanding of what to do for finding the probability of one or the other of two mutually exclusive events happening.
Unfortunately for some the final mark was not gained as they thought $1/5 + 1/10$ was equal to $2/15$.
- Q.11** Those candidates who were familiar with Pythagoras theorem scored highly on this question.
Many, however, were unable to start answering the question.

- Q.12** The mark scheme allowed,
1 mark (B1) for any correct substitution and evaluation.
1 mark (B1) for two correct evaluations using x in the range $7.275 \leq x \leq 7.295$, but crucially
one answer has to be negative and one answer has to be positive.
1 method mark (M1), that has to be seen, for two correct evaluations using x in the range
 $7.275 \leq x \leq 7.285$, but again crucially, one answer has to be negative and one answer has to be positive. If this is not shown then no further marks were permitted.
1 mark (A1) for a final correct answer BUT only if the previous M1 mark awarded.

Some candidates substituted $x = 7.28$ and $x = 7.29$ into the expression and then simply looked at which evaluation was the closest to zero. This does not gain a method mark (M1) nor the final mark (A1) even if 7.28 is given as an answer.

Others, not only lost the final A1 mark, but wasted valuable time by giving an answer to a greater degree of accuracy than was asked for.

Q.13 (a) and (b)

A multiple choice question.

The specification notes that candidates should be able to distinguish in meaning between equations, formulae and expressions, and to also recognise an inequality. More of the candidates correctly indicated that part (b) showed an equation than indicated that part (a) showed an expression.

- Q.14** A very disappointing response to finding the estimated mean.
A question which is normally well answered on the Numeracy papers.
In most cases the 'solution' shown was simply $(8 + 0 + 7 + 5) \div 4 = 5$.
No mid-points were considered let alone evaluating Σft .

Q.15 Not well answered.

Many of the candidates were not aware of how to calculate the size of the external angle of a 15-sided polygon.

Only a few candidates, who did have a value for the angle x° shown in the diagram, were able to correctly use trigonometric relationships in a right-angled triangle to calculate the length of BR.

- Q.16** Most candidates gave a correct value, but not written in standard form.

- Q.17** In many cases the upper and lower bounds of the given lengths were not shown as accurate. In particular, the upper bounds were often thought to be 24.4 and 15.4 rather than 24.5 and 15.5.
The alternative method given in the mark scheme where the difference between the least and the greatest length for each individual side is considered, was rarely seen for any candidate at the Intermediate level.

Q18 For the simultaneous equation question all the working must be shown. No marks are awarded for a 'trial and improvement' method or for any unsupported answers. The first method mark (M1) is crucial. If not gained then no other marks are awarded. To gain M1

(i) The equations must be correctly reformed such that one of the variables has equal coefficients in both. (One arithmetical error in one of the other terms is allowed.)

AND

(ii) There must be the intention to appropriately add or subtract the equations. (This is determined by what the candidates have done to the numbers on the right.)

There is of course an alternative method of substituting one variable from one equation into the other equation. This is rarely seen at the Intermediate level, but would be credited.

Q.19 (a) The mark was awarded for explaining which circle theorem was used to give the reason that angle ABC is 90° . Whilst one would hope to see 'the angle subtended at the circumference by a semicircle is a right angle' written in full, a mark was given if the key word 'diameter' or 'semicircle' was used in their explanation. Very few correct explanations were seen.

(b) Those candidates familiar with the correct use of trigonometric relationships in a right-angled triangle were able to accurately calculate the size of the angle x . Most of the candidates were unable to answer this question correctly.

(c) Writing the size of angle y to be equal to their stated size of angle x , given in part (b), gained one mark, even if their value for angle x was incorrect. The second mark was awarded for explaining which circle theorem was used to give the reason that angle y and angle x are equal. Whilst one would hope to see 'angles in the same segment are equal' written in full, a mark was given for any correct unambiguous similar wording used in their explanation. Very few correct explanations were seen.

Summary of key points

- OCW questions require, in particular,
 - an explanation at each step of the response of what is being done,
 - a structured, clear and logical lay out,
 - that all workings and calculations are shown,
 - that correct mathematical form is used, and
 - that units, where appropriate, are always given.
- Be aware of the requirements needed to earn the final two marks in the trial and improvement question.
- Estimated mean' questions may be asked on the Mathematics paper as well as the Numeracy paper.
- Know what is the minimum requirement to gain the first method mark when solving simultaneous equations.
- Candidates should use the correct wording when describing theorems.

MATHEMATICS
GCSE (NEW)
November 2020
UNIT 2 HIGHER TIER

General Comments

The number of candidates entered was significantly lower than for any previous November series.

Overall the paper was comparable with the previous papers that have been sat and was a suitable and fair test for the candidates at the Higher level.

This was a strong cohort of candidates with excellent geometry skills. Nearly all the candidates attempted all the questions. Furthermore, the grade A and A* questions were answered exceptionally well, indicating that only the more able candidates from schools were entered for this paper. However, there was a notable drop in correct responses when the question was of a slightly different nature to the standard grade A and A* style of question.

Topics that were answered less well by candidates were: correctly describing the circle theorems, higher order indices arithmetic, calculating correctly the number of permutations in probability and more advanced techniques for factorising expressions involving brackets.

Comments on individual questions/sections

- Q.1 (a)** Very well answered. The majority of candidates correctly used the multiplication law for independent events.
- (b)** Again, very well answered. Although this was a calculator paper, some candidates did the arithmetic without the use of a calculator and made the usual mistakes when adding together fractions with different denominators.
- Q.2** This was the OCW question and extremely well answered. Occasionally and quite typical of a higher tier candidate, the hypotenuse AC was calculated using the cosine rule instead of simple Pythagoras. However, the solution was usually correct with the correct answer of 216cm^2 seen on most scripts. The vast majority of the candidates also knew how to structure their solution to gain both OCW marks. Sometimes the OC mark was lost due to the candidate superfluously calculating the hypotenuse AD, which is unnecessary for this question. Rarely did a candidate write extensive notes after the mathematical solution, which is another way to lose the OC mark. The W mark was also rarely lost. Most candidates remembered to add units to their final answer and not use multiple equal signs in one line of their solution.
- Q.3** Although this trial and improvement question asked for the root correct to 2 decimal places instead of the usual accuracy of 1 decimal place, the response from candidates was of a high standard with the majority gaining full marks. Very few candidates omitted the final test of evaluating (usually) $x = 7.285$ to establish the final correct answer of $x = 7.28$.

- Q.4 (a)** Candidates were less confident in knowing the definition of an expression. If an incorrect answer was given, it was a mixture of the rest of the options.
- (b)** This part was answered better than part (a). A common incorrect response was 'formula'.
- Q.5** The vast majority of candidates knew to work out the midpoints of the class intervals and then multiplying them with their respective frequencies before adding them all together. Unfortunately, many candidates then proceeded to incorrectly divide by 4 (number of rows of the table) instead of the total frequency of 20 and therefore lost the final two marks.
- Q.6** This was the next geometry question and was also answered very well. Candidates confidently evaluated x by using either the properties of the internal or external angles of a polygon. Once this angle was evaluated, the vast majority of candidates used standard trigonometry ($8 \times \cos 24$) with only a minority using more than one step, albeit correctly, to get the final answer.
- Q.7** Again, this question had a very good response. The calculator gave an answer of 2656000 which most candidates recorded to get the first mark. The majority of candidates then proceeded to give the correct answer of 2.656×10^6 with only a few giving an incorrect power of 5. Some candidates only gained one mark for unnecessarily rounding the answer to 1 or 2 decimal places.
- Q.8** Most candidates were confident in answering this intermediate level accuracy in measurement question. Only a few candidates failed to appreciate the upper bound of the dimensions of the rectangle being 15.5cm and 24.5cm. Usually if a candidate gave incorrect upper bounds they were 15.4cm and 24.4cm. The more accurate 15.49cm and 24.49cm was seldom seen. Using the upper bounds being greater than or equal to 15.4cm and 24.4cm respectively was condoned to gain the method mark, but no further marks could be given. A notable number of candidates correctly worked out the perimeters using the lower and upper bounds (76cm and 80cm), but then failed to write down explicitly the difference or the method of doing so. However, these candidates had answered the question in essence and were still awarded 2 marks (B1 SC1).
- Q.9** This standard simultaneous equation question was answered very well by these higher tier candidates. Almost all the cohort used the elimination method. This resulted in the common pitfalls by some candidates:
- (a)** Not multiplying every term in the equations (especially the constants on the right hand side) when adjusting the coefficients of either the x term or the y term before the elimination stage,
- (b)** If the x terms were equated, then the constants should be subtracted. If the y terms were equated, then the constants should be added. Sometimes this was mixed up by the candidates,
- (c)** During the elimination process, when the equations had to be either added or subtracted to eliminate either the x term or the y term, the negative term of the equation $3x - 2y = 14$ was not dealt with correctly. Once the first variable was calculated, either correctly or incorrectly, and the initial method mark was awarded, most candidates were successful in calculating the second variable by substitution.

- Q.10 (a) (i)** A significant number of candidates failed to express themselves clearly enough to justify their understanding that the angle at the circumference subtended by a diameter is a right angle or that the line AC is a diameter. Rarely was the full, correct definition seen. A common answer was to state that the triangle was right-angled which was insufficient to gain the mark.
- (ii)** This was a standard question involving trigonometry and was answered well. Occasionally some candidates took the circuitous route of using Pythagoras's theorem and then using another inverse trigonometric ratio.
- (b)** Many candidates knew that the angle y was equal to angle x in part (a)(ii) and gained 1 mark. The value of y was a strict follow through from the candidate's value for x in part (a)(ii).
A fair amount of candidates stated the correct circle theorem unambiguously, either with 'angles subtended by the same chord (or arc) are equal' or 'angles in the same segment are equal'. However, as in part (a)(i), some candidates had difficulty expressing themselves sufficiently to justify they knew which circle theorem it was. The cyclic quadrilateral theorem was also seen occasionally.
- Q.11** (The first of the higher tier questions)
This question was different to a normal rules of indices question. Many candidates seemed unaware of the multiplication law of powers. Those who realised that 16 was equal to 2^4 (which gained a mark) then proceeded to add the 4 to 100 giving a final answer of 2^{104} .
- Q.12** Many candidates did answer this question correctly, but not always in the way intended. The base area of the cone was given, hence the candidate should have rearranged the formula for the volume of a pyramid to get the correct height which was exactly 20·12. However, a notable number of candidates noticed that the formula for the volume of a cone was given in the formulae page and therefore proceeded to work out the base radius of the cone and then in turn work out the base area again. Therefore this resulted in rounding errors because π was involved in the calculation. Also, errors were made when working out the radius due to incorrectly rearranging πr^2 .
- Q.13 (a)** Very well answered by this cohort, most appreciating that this expression was the difference of two squares. Some candidates factorised a 4 from the expression believing it to be a single bracket factorisation and then struggled to go further.
- (b)** This part was also well answered by the majority of candidates. It was clear that they had a tried and tested method to factorise the quadratic and not many mistakes were made. The incorrect signs in the brackets was the most common error, with the coefficients and constants of the linear factors usually being correct.
- (c)** This question was very poorly answered. Unfortunately the vast majority of the candidates who attempted this question expanded both brackets which resulted in a cubic expression. From thereon in, the candidates did not have the necessary skills to factorise it. The candidates should have realised that for a 2 mark question, relatively little work was involved and that this was essentially an expression of the form $x^3 + 5x^2$ to be factorised.

- Q.14** The majority of candidates appreciated that this transformation was a negative enlargement, so they either gave a correct answer of $-\frac{1}{2}$ or an incorrect -2 which still gained a mark. A candidate that realised that it was a fractional enlargement of $\frac{1}{2}$ was also given credit of one mark.
- Q.15** Many candidates did proceed to find the 2nd common difference when they realised that the first difference was not equal. However, many candidates from this point did not know how to work out the n th term of a quadratic sequence and could not go further with their solution. Only sight of $2n^2$ was credited with a mark. Candidates who did work out $2n^2$ were usually successful in finding the n th term to be $2n^2 + 1$ and correctly calculating the final answer to be 20001.
- Q.16** This higher tier upper and lower bound question was not answered as well as question 8. Although the concept is the same, candidates were less confident evaluating the bounds of a number with multiple decimal places. In this case the multiplier lower bound of 1.235 was 1.2345. Unfortunately, a notable number of candidates did not read the question carefully and failed to round their answer to the nearest pound to gain the final mark.
- Q.17 (a)** The quality of curve sketching was not as good as it should be. Although the majority of candidates knew the shape of the cosine graph, their curves failed on a few key points:
(a) too 'pointy' at the minimum of $(180^\circ, -1)$,
(b) straight lines for their curve,
(c) the curve not levelling off at $(0^\circ, 1)$ and $(360^\circ, 1)$, so it looked more like a parabola.
If the candidate lost the marks on the curve sketching then no marks could be awarded for the labelling.
- (b)** The majority of candidates gained one mark for solving the equation directly with their calculator to obtain 45.57° (2 d.p.). However, many incorrectly used the symmetry of the cosine graph and added 45.57° to 270° instead of subtracting it from 360° .
- Q.18** A complete, correct solution was infrequently seen in this probability question. The majority of candidates knew that they had to multiply the three probabilities together and therefore gained one mark. However, only a few understood that there were 6 permutations to consider for the three girls' choice of favourite walks. The candidates who did work this out correctly either listed the permutations or occasionally drew a tree diagram which clearly involved a considerable amount of time. Some candidates multiplied by 3, possibly thinking there were three choices they could make because there were three walks or because the candidate assumed they had to work with three combinations.

- Q.19** Most candidates attempted this question and knew to use the quadratic formula. Generally the expansion of the brackets was done well by candidates with the occasional slip in having 2 negative x terms resulting in $-30x$. A significant number of candidates failed to equate their quadratic equation to zero before employing the quadratic formula. In this case it was normally collecting the $19x$ on the left hand side. However, if the candidate did have a quadratic equation equated to zero, whether the equation was correct or incorrect from their bracket expansion, there was a follow through if the formula was used correctly. On the whole, candidates were very competent at using the quadratic formula. The common pitfall was incorrectly dealing with the negative b term in the discriminant ($b^2 - 4ac$). If b^2 was evaluated incorrectly to -361 when using $b = -19$ then the discriminant was still positive leading to an incorrect answer for the solutions to the quadratic.
- Q.20** This question was done extremely well by candidates, with many achieving the full 8 marks to this question. The question was a combination of using the sine rule, $\frac{1}{2}ab\sin C$ and the area of a sector. Most candidates knew how to use all three formulae and were credited for using any one of them. Some candidates lost marks by going down a more convoluted route of first finding out the bottom side of the triangle AE and then calculating side AC . Other candidates tried to use right angle trigonometry to evaluate sides and angles, hence incorrect assumptions were made. The introduction of more unnecessary calculations resulted in more rounding errors which gave the shaded area to be outside of the range. Candidates should always try to retain at least 2 decimal places in their intermediate answers during their calculations to ensure accuracy of the final answer.

Summary of key points

- Candidates should use correct wording when describing theorems.
- Dealing correctly with a negative value for the b term in the quadratic formula and ensuring the quadratic formula can only be used once the quadratic equation is equated to zero.
- More precision when sketching trigonometric graphs.
- Knowledge of the multiplication law of indices.
- Be aware that simple factorising techniques can be used for higher order algebraic expressions.



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