GCSE EXAMINERS' REPORTS

MATHEMATICS (NEW)

NOVEMBER 2017

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MATHEMATICS (NEW)

GCSE

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UNIT 1 FOUNDATION

Candidates were confident with attempting questions at the beginning of the paper, and many maintained this effort even with the more challenging questions towards the end of the paper.

Understanding the difference between chance and probability is still a problem. If a question asks for a probability, then the answer should be a numerical answer between 0 and 1 inclusive. If a question asks for the chance of an event happening, then a word is expected.

There were a significant number of questions where the instruction *Diagram not drawn to scale* was ignored (Q7, 14, 18).

1. (a) Most candidates attempted this question but very many drew a radius rather than the required diameter. Others drew a chord and some wrongly extended their diameter outside the circumference of the circle. They were penalised if they did this.

   (b) This was not answered well. Very many did not know what a tangent is and drew a radius or a diameter instead.

2. (a) Well answered.

   (b) Well answered.

   (c) Candidates found this question more difficult.

   (d) This part did not require the answer to be worked out by a reverse operation. This should have been easier than the previous parts, but very many were unable to work out $0{\cdot}6 \times 100$.

3. (a) Very well answered. The correct answer of 15 gained 1 mark. However, 15/30 gained 0 marks.

   (b) Candidates were more secure with this part. However, many did not realise that if it was impossible for Sam to choose a yellow card, then there couldn't be any yellow cards in the box. A number of candidates used words like 'no, it is impossible' which did not answer the question, 'How many cards …', and so 0 marks were awarded.

   (c) Most candidates found this difficult. They were unable to visualise what 'unlikely' meant in this context. So they could not work out the correct answer that 1 is the smallest number of cards that Sam could have if it was 'unlikely' that he chose a blue card.

4. (a) Many candidates were not secure with the knowledge of which average they were needing to find.

(b) To find the median of the given set of numbers, candidates needed to list the numbers in numerical order and then identify the middle one. Some just used the list of numbers as it was given, and wrongly found the middle number to be 18. Others omitted one of the numbers from the list and gave the median as 18 and 20.

5. (a) Very many candidates were able to state that the fraction shaded is 5/15 but were then unable to write this in its simplest form.

(b) This was answered well. The most common wrong answer was only four squares being shaded instead of the necessary eight squares.

6. (a) Many circled the correct answer of 44000.

(b) Candidates found this a difficult question. There was only one number in the list of five numbers which was both a square number **and** a factor of 63. This was 9. Many candidates wrongly chose two numbers to circle as three of the remaining numbers were factors of 63 (3, 21, 7), and the last number was a square number (16). So they chose one from each of these groups.

7. Many candidates wrongly thought that the sum of the angles at a point is 180° instead of the correct 360°. Others tried to measure the angle *y,* ignoring the instruction that the diagram was not drawn to scale.

8. Most candidates attempted this question but very many were unable to shade in the necessary squares to create the correct diagrams.

(a) The condition that there should be only **one** line of symmetry in the resulting diagram proved difficult. Candidates shaded in only two extra squares but the resulting diagram frequently had two lines of symmetry.

(b) This part was very challenging. Shading the central square was the most common wrong answer.

(c) Very many shaded in the two empty corner squares but the resulting diagram had rotational symmetry of order 4, whereas rotational symmetry of order 2 was needed.

9. Many confused area and perimeter, finding the product of their lengths for Rectangle B rather than the sum of the four sides. Not everyone knew to multiply the lengths of the sides of Rectangle A by 5, instead adding 5 to each side despite the words 'five **times** as long'. The OCW marks could be accessed only if the candidate had engaged with finding the lengths of Rectangle B and working out its perimeter. Not a great deal needs to be written in the answer of this type of question but labels like "Perimeter = …" were necessary for the OC mark. Writing something like 25 x 5 = 125 + 40 = 165 is mathematically wrong and the W mark was lost immediately. This W mark was also lost if there were no units given with the final answer. So a final answer: "Perimeter = 330" got W0 although it would have gained 3 calculation marks as the correct numerical answer was given.

10. (a) This question asked for a line to be drawn from the point Y at the right-hand end of the line given in the question. Many found that difficult, choosing to draw the line from X or at a random point on the line XY. A significant number were unable to draw the angle 63° or the line of length 7·2 cm correctly.

(b) To find the size of angle, *a*, it was expected that the unmarked angle would be measured using a protractor, and then that angle subtracted from 360°. However, a variety of wrong answers were given. Some wrote down 40° but did not subtract it from 360°. This gained no marks at all.

11. Candidates answered this question confidently and usually well.
A frequent wrong answer to the equation x – 3 = 7 was x = 4.
Common wrong answers to 7x = 42 were either x = 7 or x = 12.

12. (a) There were many different ways of getting the wrong answer to this question:

- 3^4 = 81 and 10^3 = 1000, but 3^4 x 10^3 was written as 1081 or 8100 etc. instead of 81000.
- 3^4 x 10^3 was written as 30^7.

Many wrongly thought that 3^4 is the same as 3 x 4 = 12 and that 10^3 is the same as 10 x 3 = 30. Then, they would give the answer as 12 + 30 or as 12 x 30.

(b) 1·82 was a common wrong answer.

(c) Very many candidates were unable to do the required subtraction. They did not find a common denominator. Time and time again, the answer to 5/6 –2/3 was given as 3/3, obviously subtracting the numerators and the denominators.

Arbitrary rules appeared such as 5/6 – 2/3 = 5/6 – 3/2, using a half-remembered method for dividing fractions.

(d) This question also caused serious problems. Very many times, the answer to 0·2 x 0·3 was given as 0·6 or 0·006, instead of the correct 0·06.

13. Many of these rules of algebra were not known. It appeared that true/false answers were chosen arbitrarily. Particularly obvious was that g x g x g was thought to equal 3g.

14. A significant number of candidates did not engage with finding the volume of Cuboid A or Cuboid B. They added the lengths of the three given dimensions instead of multiplying them, and some measured the length of *h* despite there being an instruction under the diagrams saying that they were not drawn to scale. The need to equate the volumes of the two cuboids was missed by a lot of candidates, so they did not form an equation which could be solved to find *h*.

15. Very many candidates got at least 1 mark for this question, though not many got the fully correct answer of 3/5 or its equivalent. Finding a multiple of 0·2 was challenging but choosing a fraction either greater than 1/2 or less that 75% was found to be much easier. Some gave the answer as a percentage or a decimal which meant they lost 1 mark from any they might have gained.

16. Wrong answers were frequent as candidates found it difficult to deal with the brackets correctly.

Some correctly worked out 15x – 10 but then followed this by 5x, thereby losing the mark they had gained.

Other wrong answers included 15x – 3, 5 – 3x and random multiples of x e.g. 7x.

17. (a) This was a difficult question to answer if you didn't use a systematic method to find the 9 numbers made by the spinners. Listing the numbers helped.

(b) Very many were unable to identify the prime numbers in their list in (a).

(c) This was the most successful part of Q17. Many were able to write down the probability of a person making a prime number but there was still a very large number of candidates who wrongly wrote down 'unlikely 'or 'likely'. This meant that immediately they were unable to attempt (d).

(d) Candidates found it very difficult to engage with both stages of this answer. First, they had to use their answer to (c) to find the number of winners in the game and then they needed to find the expected profit. This was very demanding for many.

18. This question involved proof which was very difficult for many candidates. Most didn't realise that all working must be clearly stated for marks to be awarded. Answers alone weren't adequate. So 360°- (85° + 122° + 93°) had to be seen before the first method mark could be awarded.

As in Q14, some candidates wrongly measured lengths of lines and the sizes of angles to try to answer the question.
To gain the final, explanation mark, candidates had to show or state that the three angles in triangle APQ were each 60°, and that this made the triangle equilateral.

MATHEMATICS (NEW)

GCSE

November 2017

UNIT 1 – INTERMEDIATE

The paper was similar in standard to the previous two Unit 1 Intermediate papers set, and contained many questions on topics that were tested in the Specimen Assessment Materials (SAMs).

Candidates performed poorly when standard topics were tested in an unfamiliar fashion (e.g. basic conventions of algebra and properties of special types of quadrilaterals).

It was evident that many have a brief familiarity with topics such as transformation, constructions and standard form, but do not possess a full understanding of these topics.

Question 7 asked for a proof. Few candidates understood that this meant that they had to present facts that led to the required conclusion.

There was evidence that some candidates were not familiar with the whole of the Intermediate specification content.

Question	Comment
1	(a) Not as well answered as expected with many candidates failing to gain both marks. Some added the 81 and 1000 giving a final answer of 1081. 30^7 was a popular incorrect answer. (b) If the question asked had been, ‘How many ½ are there in 1?’, I suspect the response would have been overwhelmingly correct. Disappointing therefore to note that even the most basic of mathematical symbols are not fully understood by some candidates. (c) Well answered with only a few errors. (d) A common denominator was used by most candidates to find the correct answer. As expected the usual incorrect answer was 3/3 = 1. (e) As many incorrect answers of 0·6 were seen as the correct 0·06.
2	This question was testing the candidates’ understanding of the basic conventions of algebra. Very few chose the correct response to all five statements. The ones that were most misunderstood were ‘ that the expression 7y – y cannot be written as 7’, and ‘that when a=1, b=2 and c=3 then a + b + c = abc’. Only a few candidates made use of the working space provided at the bottom of the page.
3	(a) 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 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). For the OC mark (organising and communicating) we are looking for an explanation for each step of the work e.g. 'Volume of A = 6×2×3 = 36cm^{2}' rather than simply '6×2×3 = 36cm^{2}'. For the W mark (accuracy in writing) it includes accuracy in mathematical writing. Correct mathematical form is required. Units, where appropriate, should be shown. We do not want to see, for example, ‘Volume = 2 × 2 = 4 × 9 = 36’. Candidates performed well on this question even when the OCW marks were not fully gained. (b) A poor response when considering that '1 litre = 1000 cm^{3}' is one of the simplest metric relationship that candidates are required to know.

4	The second and third condition meant that any fraction would satisfy at least one of the three conditions. The fact that ‘a’ and ‘b’ had to be integers did prevent some candidates from gaining a mark.	
5	(a)	Very well answered.
	(b)	The answer had to be given as an expression. Those who simply wrote 5 × 3x = 15x followed by 5 × −2 = −10 did not gain the mark. Some candidates lost the mark for their incorrect further work e.g. 15x – 10 = 5x.
	(c)	Having successfully reached 5x = 2 there were more final incorrect answers of x = 5/2 than the required final answer of x = 2/5.
6	(a)	Those who listed the nine numbers were not penalised.
	(b)	Some gave 21 and 33 as prime numbers.
	(c)	Well answered with many gaining ‘follow through’ marks from their answers to part (a) and part (b).
	(d)	There was some confusion between ‘Number of winners’ and ‘amount of money’. Having correctly evaluated 4/9 × 180 as 80, they then took this to be £80 rather than 80 players.
7	Not well answered. Many of the candidates did not appreciate that they had to <u>prove</u> that the triangle APQ was equilateral. This meant showing, through calculations, that all three angles were 60°, rather than assume they were 60°. It was not enough to state facts that were true simply because triangle APQ was equilateral. The two steps required were (i) use of the fact that angles in a quadrilateral add up to 360°, and (ii) use the given fact that triangle APQ is isosceles.	
8	Multiple choice question. All three parts were testing the candidates’ knowledge of the essential properties of special kinds of quadrilaterals. It was clear that although they may know what each of the quadrilaterals look like, they were not fully aware of their individual properties. It was noticeable that those candidates who had more success on this question had used the space at the bottom of the page to draw sketches of each shape.	
9	(a)	Calculating the correct value for *y* when substituting into the quadratic proved difficult for some of the candidates. Candidates should be encouraged to check their answer to this part if their original answer does not obviously fit onto the expected quadratic curve shape. Candidates were asked to choose a suitable scale for the y-axis. This meant (i) a scale that could be easily read and (ii) a scale that made full use of the graph paper available whilst accommodating all the points that needed to be plotted. The two acceptable scales on this occasion were ‘2cm ≡ 5 units’ or 2cm ≡ 4 units’. As it turned out candidates were equally divided on which scale was used. In most cases the coordinates were accurately plotted on the graph paper. Candidates should take care to draw a smooth curve passing through (not just in the vicinity of) all of their plotted points. Marks were lost if the plotted points were joined by straight lines.
	(b)	There was hardly any evidence of candidates using the simplest way to decide on the correct answer. That is, asking what happens when x = 0.
10	(a)	Many rotated the triangle through 90° clockwise about the origin rather than about the point (−2, 3).
	(b)	Very poorly answered. Most enlarged the triangle by a scale factor of 2 rather than a ½. Having (0, 0) as a centre of enlargement added to the difficulty.

11	If this had been an OCW question not many would have earned the marks for clearly explaining their work. There were alternative approaches to solving the question but each one did entail using the fact that 'tangents from an external point to a circle are equal in length' and 'that the tangent at any point on a circle is perpendicular to the radius at that point'. On this occasion marks were awarded for any kind of indication that these properties were being considered. Many candidates at this level are unsure about the notation OQR. Often the angle was correctly shown as 15° on the diagram but incorrectly given in the answer space.
12	Whatever skill is asked in a construction question it is not well performed. Lots of candidates simply drew a perpendicular line from point P to the line AB and then drew a plethora of random arcs crisscrossing the line in an attempt to show a proper construction method had been carried out. It was easy for markers to identify when an acceptable method had been properly carried out.
13	(a) The fact that simply writing the number 0·00042 in standard form was not done correctly by many of the candidates did not augur well for the rest of this question. (b) Rather than deal with the indices directly most took the laborious route of trying to evaluate 7200000 ÷ 0.02. Candidates' performance on part (b) was significantly worse than on the other two parts. (c) Again most candidates did not use the efficient method of $4{\cdot}7 \times 10^5 - 0{\cdot}62 \times 10^5 = 4{\cdot}08 \times 10^5$.
14	Quite well answered. The main error was to include the 9 and the 22 in single cells rather than realise that these were total numbers for a whole set. This led to a follow through answer of 22/41 which was given credit in the mark scheme.
15	Those candidates who were familiar with this kind of question answered it well. It appeared however that many of the candidates were unaware of how to factorise this type of quadratic equation.
16	This question tested the candidates' ability to solve two given simultaneous linear equations. Unless an acceptable method was shown of how to eliminate one of the variables then no marks were awarded. An appropriate addition or subtraction (in this example it was invariably a subtraction that was required) is deemed to have been attempted if the constant terms have been dealt with correctly. A 'trial and improvement' method is not acceptable when solving simultaneous equations.
17	Basically this was about comparing the volume of a cube and the volume of a cylinder. Both topics usually tested at a much lower grade than this. The context of the question however meant that very few candidates gained any marks. When faced with this type of question candidates should at least write down what they know, even if they do not fully solve the problem. Marks would have been gained for simply writing m^3 for the volume of the cube and $\pi \times (m/2)^2 \times m$ for the volume of the cylinder.

MATHEMATICS (NEW)

GCSE

November 2017

UNIT 1 - HIGHER

This was the third time that candidates had sat the new Mathematics GCSE examination. Pupils' performances once again reflected the increased demand of later questions in the paper. The fact that, overall, relatively few questions were not attempted meant that candidates had been appropriately entered for this tier.

Question	Comment
1	This question was very well-answered by most (particularly part *(b)*). As is usually the case with multiple-choice questions, those candidates who engaged with the question e.g. by sketching quadrilaterals, tended to be the most successful.
2	Calculating the missing coordinate value was almost always done correctly, which helped candidates enormously when going on to plot the points and sketch the quadratic graph – any errors in calculating were usually due to producing a negative answer on squaring -1. As was the case for similar previous questions, if the missing coordinate was incorrectly calculated in part *(a)*, candidates did not seem to appreciate the need to revisit their calculation in order to produce a smooth parabola. In drawing a 'curve', some were penalised for joining all of their points with straight lines. A number of candidates struggled with the requirement to choose an appropriate scale; the choice of scale needed to make good use of the available grid and also needed to allow for all the points to be plotted. It was a concern that the scale was not always given as uniform (in some cases, different scales appeared above and below the x axis). Most candidates selected the correct equation for the curve in part *(b)*.
3	*(a)* The rotation was usually completed correctly. Otherwise, common errors included rotating about the origin, or (less often) reversing the coordinates of the given centre. Only a few candidates rotated in the wrong direction. *(b)* Again, the enlargement was usually undertaken correctly. Common errors this time included misinterpretation of the centre (resulting in an incorrectly positioned shape with the correct dimensions and orientation), or enlarging with a scale factor of -½ (rather than the required ½). Weaker candidates enlarged with a scale factor of 2.
4	There were several possible valid approaches to answering this circle theorem question, and many excellent solutions were seen. One common error, however, was to state angle *QOR* to be 60° (misinterpreting it as an 'angle at the centre'). It was also common to see *QOR* given the (correct) value of 150° via incorrect reasoning, in particular treating angles *QOR* and *QPR* as 'opposite angles of a cyclic quadrilateral'. For the OCW requirement of the question, plenty of candidates performed well, presenting well-structured solutions, though others needed to engage more fully with the need to 'communicate' by quoting circle theorems and geometric rules adequately. (Incorrect spelling of the word 'isosceles' was an occasional issue.) For the 'writing' aspect, some candidates were penalised for misuse of the 'equals' sign (typically within a calculation to find the missing angle in an isosceles triangle), whilst inappropriate notation for naming lines or angles was also widespread.
5	Most candidates were able to express the necessary numbers in standard form. In part *(a)*, however, some gave a negative power of 10. Dividing the indices, rather than subtracting, was a common error in part *(b)*. In part *(c)*, some candidates failed to account for the different place values of the given numbers, including in some cases inappropriately adding 4·7 and 6·2.

6	Plenty of candidates constructed the required perpendicular line in this question, either by marking a suitable arc (or arcs) on line *AB* and then obtaining the perpendicular bisector of the resulting length, or by treating *A, P* and *B* as three vertices of a kite (with *AB* as the line of symmetry). Successful candidates showed clearly that they had used a ruler and pair of compasses for their construction, however there was sometimes evidence of 'fixing' the result. One common misunderstanding was drawing the perpendicular bisector of line *AB*, without recognising the need to pass through *P*.
7	A significant number gained full marks here. Of those who did not, many did not fill in the Venn diagram correctly e.g. putting multiple different values within the same region of a circle, then including all of these within the total in order to evaluate the probability. The need for correct notation for a probability (as a fraction on this occasion) should be noted.
8	Full marks were common for this question. Otherwise, sign errors sometimes arose within the factorisation, or when either bracket was equated to zero.
9	Plenty of candidates demonstrated secure algebraic skills in correctly solving the simultaneous equations. The most common errors were caused by mis-handling minus signs or failing to multiply consistently throughout an equation. In attempting to eliminate a variable, only a few chose incorrectly between addition or subtraction of their equations. There was very occasional difficulty in coping with 14/4 (arising from substituting the value of y into the first equation), sometimes evaluating it to be 3·2.
10	Most candidates could write down an expression for the volume of the cube, but too many could progress no further. Of those who attempted to find an expression for the volume of the cylinder, many omitted to square the denominator of the relevant fraction. Only a few candidates understood how to write their expressions within an appropriate ratio, with even fewer able to go on to correctly simplify the ratio.
11	Many were able to give a correct inequality relating to the horizontal line, but relatively few could deal with the sloping line. Errors were often made in the directions of the inequality symbols.
12	In part *(a)*, it was necessary to derive the given quadratic equation. Some successful solutions were seen, but weaker candidates did find this part of the question very difficult, often attempting to solve the equation here instead (even though not required until part *(b)*). Squaring (x + 3) was a common cause of difficulty. It was also a concern that some candidates expressed 3x as opposed to 3 + x for '3 longer than x'. In part *(b)*, it was necessary to solve the quadratic equation; most opted to factorise, and usually did so correctly. (Use of the quadratic formula was seen occasionally, but tended to be unsuccessful. Candidates should note that use of trial and improvement is not an appropriate approach to solving a quadratic equation.) Having solved the equation, not all candidates gave a clear reason for discarding a negative answer (as it could not represent a length).
13	While some candidates gained full marks in this question, others showed a lack of understanding of 'inverse' proportionality in part *(a)*, answering as if it were direct proportion. Even having started correctly and obtained 120 = k/8, it was surprising that this often led incorrectly to k = 15 as opposed to k = 960. Part *(a)* clearly required the candidate to 'find an expression for y in terms of x', but it was common for the final expression not to be given explicitly. In part *(b)*, most knew how to start, but the majority had difficulty in dealing with the given y value of 15.

14	This question tested candidates' understanding that triangles with the same three angles are similar but not necessarily congruent. Some excellent explanations were given, but it was a concern that many candidates thought that 'angle, angle, angle' (or equivalent) could be quoted as a definite case of congruency. Many candidates did not calculate missing angles despite the question asking for 'full reasons'.
15	*(a)* This was often well done, though there were some place value errors in multiplying the recurring decimal by a power of 10. Another (less common) error was to treat the given decimal as if it were entirely recurring, namely 0·642642642…. *(b)* Many correct answers were given, though there was a wide selection of wrong answers, frequently 1/6, but also including ±1/18 or ±18.
16	It was notable (as in question 1) that those candidates who engaged with each part of the question and did some associated written work tended to be the most successful. This was particularly true for part *(c)*.
17	Many candidates demonstrated fluent algebra here and achieved full marks. Those who did not usually failed to recognise the need to factorise the difference of two squares in the denominator. It was also common to incorrectly 'eliminate' the constants as a first step.
18	Most candidates appeared to be familiar with function notation, though errors included giving expressions for translations in incorrect directions (both horizontal and vertical).
19	A wide variety of methods were used throughout this question, including multiplying probabilities (sometimes with a tree diagram), listing possibilities or using a 6x6 table (with deleted diagonal entries) to illustrate the sample space. Some successful solutions were given in part *(a)*, though candidates did not always know that they should account for the different possible ordering of the cards. Part *(b)* was less well-answered than part *(a)*, often because not all of the relevant possibilities had been considered. A few failed to observe that the blocks were selected without replacement throughout the question.

MATHEMATICS

GCSE

November 2017

UNIT 2 - FOUNDATION

This was the third time that candidates sat the new Mathematics GCSE specification. As in the last two examination windows, it appears that the majority of candidates who entered were working at F/G grade. It was evident that fewer candidates attempted the Intermediate crossover questions than those in June, suggesting that fewer of the candidates had covered the course in its entirety at the time of the examination.

1. (a) This question was the most attempted in the paper, though it was answered correctly by only just over half of candidates. It was clear that many candidates didn't know that a million has six zeros, with numbers ending in four or five zeros being the most common responses.

   (b) Candidates found this question very challenging, with nearly all incorrect responses being the anticipated 'two point forty six' instead of 'two point four six'.

   (c) This question was answered correctly by a majority of candidates. The most common incorrect response was placing the brackets around the two numbers at the start of the calculation. Some candidates attempted to change the answer of the calculation to 22, totally ignore the instruction to insert brackets.

   (d) Part (i), where candidates had to write the largest number they could using all four digits, was the second best answered question on the paper. Part (ii) was answered correctly by less than half of candidates – they typically embraced the smallest number aspect of the question, though many responses were odd, ignoring the condition for their number to be divisible by 2.

   (e) Candidates found this question very challenging, with very few correct answers seen. The common incorrect answer was $5 – 488 \div 16 = 30.5$, with many candidates interpreting the .5 to suggest a remainder of 5.

   (f) Candidates were assessed using inequality symbols in the June series, and whilst they were slightly more successful in this paper, it was clear that they still found this question very challenging.

2. This question wasn't answered well by candidates. Part (a), where candidates had to draw a parallel line, was answered a lot more successfully than part (b), where candidates had to draw a perpendicular line. The most common response was to just join up points A and B. There was very little evidence of anticipated confusion between parallel and perpendicular lines.

3. (a) This part was very well answered by candidates, with over 90% of candidates answering correctly.

   (b) This part was answered less well than part (a), though was still one of the most successfully answered questions on the paper. Some candidates described how to continue any linear sequence without actually stating what the rule was for this sequence (e.g. you find the difference between the numbers in the sequence and keep adding this number on to find the next numbers).

4. This question was answered poorly by candidates. It was anticipated that candidates would find the statements involving congruence to be the most difficult in this question, however candidates seemed to have little understanding of what it means for a triangle to be isosceles or for a shape to be regular either.

5. This was the OCW question in the paper. Nearly all candidates were able to find the number of girls in the class but then did little else. Candidates showed little understanding of what an even chance meant, however those that did typically went on to answer the question correctly. Some candidates attempted to answer the question without showing any calculations at all in their response, and were hence unable to achieve the Accuracy in Writing mark.

6. (a)+(b) Candidates who knew that when writing coordinates the x coordinate is written first typically answered both parts correctly. Many candidates omitted brackets from their coordinates, and in some cases candidates missed out the comma as well.

   (c) This part was answered very poorly by candidates. The most common incorrect response was ‘No, because the grid only goes up to six’.

7. (a) This question was answered correctly by over a third of candidates. Most common incorrect responses were due to candidates dividing 37 by 4 to find Kian’s number, instead of multiplying it by 4. Candidates were typically able to find 10% of whatever they thought Kian’s number was, though some rounded or truncated their answers and hence lost this final mark.

   (b) This question was answered a lot more successfully than part (a). Many candidates were awarded two out of the three marks, as even though they realised the number between 1 and 9 was four, they then went on to write 49 as Sophie’s number on the answer line.

8. (a)+(b) Both part (a) and part (b) were answered correctly by just under a third of candidates. Typically, if a candidate answered part (a) correctly they went on to answer part (b) correctly. Many candidates included additional zeros in their answers (e.g. 4.47367 to 1 decimal place = 4.50000) which lost them the marks.

9. (a) This part was answered correctly by over a half of candidates. The most common incorrect answer selected by the candidates was $2x^6$.

(b) Candidates did less well on this part where candidates had to substitute a value into an expression. Incorrect answers were quite varied, though 21 185 was chosen slightly more frequently than the others.

10. (a) This part was answered correctly by just over a third of candidates. The most common incorrect method was to multiply 8 by 3.25, though some candidates attempted to use the partitioning method, which is much better suited for a non-calculator paper, usually making errors along the way.

(b) Candidates found this part very difficult. Some candidates gained 1 mark for calculating 0.65 × 280 correctly, though they found it much more challenging to calculate 2/9 of 513 – candidates who did were typically awarded all three marks. 181.77… was a very common incorrect response, obtained by candidates subtracting 2/9 from 182, totally ignoring it was meant to be 2/9 of 513 that should be subtracted.

(c) Most candidates were able to work out the calculation using their calculators, though were then unable to give their answer to the required accuracy (two decimal places) – some truncated, though many had no idea what they needed to do.

11. (a) Out of the two parts of question 11, both assessing time, this part was comfortably the better answered by candidates. It was common for candidates who have 2 out of the 3 components of the answer, and were hence awarded 1 out of the 2 marks available. Few candidates had full marks for this part, though there were no glaringly common incorrect methods used.

(b) Candidates found this part very difficult, with very few correct answers seen. Nearly all incorrect responses were 3.24, obtained by calculating 16.20 ÷ 5.

12. (a) Just over a quarter of candidates answered this part correctly. Some candidates clearly confused median and mean, though some simply had no idea what to do.

(b) Lots of candidates were able to calculate the current mean correctly, with some going on to identify the new mean of 8. Very few carried on further than this. It was evident that some candidates confused the mean and the median in this part, as they had done in part (a).

13. Very few candidates answered this question correctly, with few candidates showing awareness of the formula to calculate the area of a trapezium, despite it appearing on the formula list at the front of the paper. Candidates rarely gave units with their answers, despite an independent mark being available for candidates who gave the correct unit of cm^2 with their answer.

14. (a) This part was answered correctly by very few candidates. The most common incorrect method was to start by dividing 129 by 54, though some candidates divided 54 by 100 before attempting to multiply their quotient by 129.

(b) This part was answered better than part (a) but was still lower than expected for a standard ratio question. In nearly all incorrect responses candidates divided 25.8 by 5 instead of by 6.

15. Few candidates gave a correct response of 50 to this question. It was common to see candidates dividing 325 by 2 to get an answer of 162.5, though some recognised that each card would be selected 25 times but didn't go on to multiply 25 by 2.

16. It was very rare to see a fully correct answer for this question. Candidates typically picked up marks by identifying the side length of the square to be 8.4, with some going on to calculate the area of the square to be 70.56. Very few candidates attempted to calculate the area of the semi-circle (or even the circle) – those who knew the correct formula, typically went on to give a fully correct response.

MATHEMATICS (NEW)

GCSE

November 2017

UNIT 2 – INTERMEDIATE

The paper was similar in standard to the previous two Unit 2 Intermediate papers set, and contained many questions on topics that were tested in the Specimen Assessment Materials (SAMs).

Unexpected difficulties arose on some questions such as calculator work (Q1b) and giving answers to a required degree of accuracy (Q11).

The question dealing with time (Q2) was not well answered, and the concepts of LCM and HCF (Q13) are not fully understood.

There was evidence that some candidates were not familiar with the whole of the Intermediate specification content.

Question	Comment
1	(a) Some candidates did not use their calculator for the calculation. This not only wastes valuable examination time but also leads to errors when pre-approximation takes place e.g. '1% of £3.25 = 3p'. Marks were also lost as the final answer often displayed incorrect units such as 0.26p. Another common error was to use 0·8 rather than 0·08 for 8%. (b) This was meant to be a very simple question on using the calculator. It however became clear that many candidates did not understand how to order number operations. A number often seen in the calculation offered was 181·77…. This coming from 0·65 × 280 – 2/9. (c) Well answered, with most candidates giving their answer correctly to 2 decimal places.
2	Candidates find it difficult to deal with questions involving time periods. (a) This part was fairly well answered, the common error being 6 hours (from 13 – 07) and 10 min (from 30 – 20). A few answers recorded the hours and minutes as extremely large numbers. (b) This was not answered well. Many treated the 16 hours 20 minutes as a decimal and simply wrote 16·20 / 5 = 3hr 24m. Others did slightly better by converting the 16 hours 20 minutes to 980 minutes before dividing by 5. However they then proceeded as follows, 980/5 = 196, 196/60 = 3·26…, and gave their final answer as either 3hr 26m or 3hr 27m.
3	(a) Many took the 9 to be the median as it is the number that is centred in the given display, and then added another 9 on the blank card. (b) This was well answered, and in most cases, presented in a clear and logical way. Some lost the final mark simply because they had forgotten what was required in the answer space e.g. (6 + 8 + 13 + 5) /4 = 32/4 =8 which is all correct, but they then gave an answer of 8.
4	Part (a), in particular, and part (b) were well answered in this multi choice question. (c) Not so well answered, with 040° being a popular incorrect answer.
5	Candidates appear to be more aware of the formula list given on page 2 than in previous series. There were far more correct answers seen than on previous papers for this type of question. It was also pleasing to note (in contrast to Q1b) that correct use was made of the calculator in evaluating the area. There was a demand to give the units of the answer which sadly a few candidates failed to do and hence lost a mark.

6	(a) Many took the question to be 'Find 54% of 129' and gave an answer of 70 to the nearest whole number. (b) Very well answered with the majority of candidates gaining full marks. The most common error was to give answers of 5·16 and 25·8 (from 25·8/5 and 25·8/1).
7	Most candidates specifically used probability to find the answer, using 2/13 × 325. Others used the fact that each letter should be selected 25 times, and so the '**Y**' would appear 2 × 25 times. Those who left their answer as 50/325 only gained 2 of the 3 marks available. Those who thought that 2/13 × 325 = 625/4225 only gained a mark for the sight of 2/13.
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 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). For the OC mark (organising and communicating) we are looking for an explanation for each step of the work. e.g. 'Area of the square = 8·4 x 8·4 = 70·56cm^2' rather than simply '8·4 x 8·4 = 70·56cm^2' '. For the W mark (accuracy in writing) it includes accuracy in mathematical writing. Correct mathematical form is required. Units, where appropriate, should be shown. We do not want to see, for example, 'Area of semicircle = π × 4·2^2 = 55·4 = 55·4/2 = 27·7'. Some candidates used the formula for circumference when attempting to calculate the area of the semicircle.
9	Many candidates failed to realise that they had to form an equation in order to find the value of x. Some did know that the angles at B and C were equal and proceeded to find the value of x by trial and improvement. There were three relatively easy marks to be gained once the candidate had established a value for x.
10	A multiple choice question testing their knowledge of indices. The three parts yielded diminishing success. (a) Well answered. (b) It was the 3·4/13·6 part rather than the g^8/g^2 which seemed to cause more problems. (c) Very few gave the correct answer of 1. I assume that they thought an expression with so many 'm' in it could not possibly simplify to something devoid of any 'm'.
11	Those candidates familiar with this type of question usually gain all four marks. In this instance many lost the final mark as they did not give their answer correct to 1 decimal place. Having gained the crucial third mark for carrying out the check at x = 4·35 and finding it was extremely close to the required value, they gave 4·35 as their final answer instead of 4·3. Some did not carry out the necessary check required (e.g. looking at 4·35) to establish that the answer was 4·3 and not 4·4, and therefore only gained two marks.

12	(a) Pleasing to note that many of the candidates realised that in order to answer the question the length of AB had to be calculated using Pythagoras' theorem. (b) The error seen on most scripts was the use of 'mixed units' where the area found in part (a), given in cm^2, would be multiplied by the length of the prism given in metres.
13	Whilst there was a familiarity with the topics of LCM and HCF it appeared that there was little understanding of what either of them meant. Solutions would start off in a promising fashion with the numbers given being broken down into their factors. However this often did not lead to any conclusion (or sometimes the wrong conclusion arrived at) and so the actual LCM of 12, 18 and 24 was never identified. Similarly the HCF of 36 and 54 was never identified although all the preparatory work had been done.
14	(a) Those with algebraic understanding answered the question well. Many however fail to follow the basic conventions of algebra, with 7y – 3 being equated to 4y being one of the worst examples. For those who do follow the rules, it is important for them to note that in questions where they are asked to rearrange a formula, that they end up with a formula, x = (5y−3)/2, and not an expression, (5y−3)/2. (b) Most of the candidates did not know how to find the nth term of a sequence where the rule is quadratic
15	A very accessible six marks for those who were familiar with using trigonometric relationships in a right-angled triangle. It appeared, however, that many candidates had not covered this part of the specification.
16	(a) Well answered. There were a few interesting incorrect values such as 0·23 on the 'car branch' and 8/7 on the 'other day' branches where candidates had apparently decided to mix and match their 'decimal' probabilities with their 'fractional' probabilities! (b) This part was challenging in that the question being asked required careful reading. The mark scheme was such that it allowed a mark if the requirement was misunderstood.

MATHEMATICS (NEW)

GCSE

November 2017

UNIT 2 - HIGHER

In this third series, following the first full year of the new Mathematics GCSE specification, hopefully candidates, and centres, will, by now, have a better understanding and feeling for the papers along with the assessment objectives that they need to observe. The A/A* topics of the syllabus have been covered in these sittings with some topics appearing again on this paper, albeit in slightly different formats.

The standard of the paper is comparable to the two papers already sat, with a few questions deemed to be slightly more accessible, especially compared to the summer 2017 paper.

The standard was generally higher across the paper compared to summer 2017, but there were some questions where the responses as a whole were surprisingly lower than expected by candidates at this level. From the scripts seen, and the responses to certain questions, along with their perceived difficulty, the standards vary greatly. For example, for a few questions, candidates gained either full or nearly full marks, or otherwise no marks, or close to no marks – seldom did they gain around half marks on these questions.

Although the AO3 questions were placed intermittently throughout the paper, a significant number of candidates were not able to get started on these (even the questions at the start of the paper). We could normally expect them to be able to gain at least some of easier introductory marks within each of these longer questions. The concept of mathematical proof and the rigour it entails was also lacking in many responses.

Areas of the syllabus that require attention include:

- Conversions between units in two and three dimensions (e.g. $1\text{m}^2 = 10000\text{cm}^2$),
- Rigour in proof (not making assumptions),
- Subtracting an algebraic expression effects the signs of every coefficient [e.g. $-(x-1) \equiv -x+1$],
- Correct terminology for angles in parallel lines (alternate angles instead 'Z' angles, etc.),
- Combinations in probability,
- Ratio of volumes and the related linear ratio,
- Recognising and sketching graphs,
- Multi-step cosine rule and areas of sectors and triangles.

Question	Comment
1.	(a) The majority gave an answer of $18g^9$, with $18g^{18}$ being the usual wrong answer. (b) Although the candidates had a calculator, and 3.4 ÷ 13.6 = ¼ was often seen, this question was not as well answered. The most common wrong answer seen was $4g^6$, although $g^4/4$ and $4g^4$ were also seen regularly. (c) As this was part of the first question on the Higher tier paper, it was disappointing to see the answer 'm' offered just as often as the correct answer, '1'.
2.	The majority of candidates answered this question well, with a significant number gaining full marks. Apart from the obvious error of not testing to find the answer correct to 1 decimal place (usually by trialling $x = 4.35$), other slips seen were not finding values of x, correct to 1 dp, either side of 91, or not using the given formula correctly. This question really tested the candidate's understanding of trial and improvement, because the usual 2 decimal place test (4.35) gave an answer of 91.01… which is very close to the answer the root would give. Candidates who did test 4.35, and gave the answer as 91 or 91.0, were not able to state whether this was too high or too low (some even went as far as to say, incorrectly, that x was exactly 4.35). The candidates who adapted the equation to $x^3 + 2x – 91 = 0$ fared just as well as those who did not.
3.	This question asked the candidate to bridge algebra and geometry. Either mainly full marks or 1 mark for the basic property of the angles of a triangle were seen. The candidates who initially equated the $4x – 3$ to $x + 48$ usually went on to gain full marks. A few unsupported $x = 17°$ were seen, from which they were able to go on to gain $y = 50°$ and full marks. However, many candidates failed to set up the initial equation, and gained the easier B1 from the alternative method for stating that $(4x – 3) + (x + 48) + y = 180$ or equivalent, but then could go no further. From this point they tried to solve the equation using simultaneous equation techniques.
4(a).	This was the OCW question and was answered better than question 3. The first part of the question needed candidates to use Pythagoras and was generally well answered – only a few candidates wrongly added the two squared numbers. Some candidates took on more work for themselves, by utilising trigonometry, either in order to find the length AB (using trigonometry twice), or to find the angle at C (with the intention to use A = ½abSinC). If the length AB had been found, correctly or not, then candidates usually went on to find the area for their values. However, if the angle at C, or sometimes the angle at B, was found, candidates still made slips in calculating the area when using A = ½abSinC. As regards to the OCW element, for the first strand, 'organising and communicating', candidates were required to explain what they were doing at each stage, where reference to 'AB' and 'Area' would usually suffice, and also present their work in a structured way that was clear and logical. For the second strand, their 'working', candidates were expected to use correct mathematical form throughout, and use the correct units for lengths and areas as appropriate. The majority of candidates were able to do this, and gained at least 1, if not both, of these marks. It was pleasing to see that mathematical form was correct in most responses. The multiple = sign on one line was not prevalent.
4(b).	The vast majority of candidates were able to gain the first mark, for multiplying their area, from (a), by 2, but the number of candidates who realised that they needed to convert the 2m to 200cm was significantly less. Of those who did multiply by 200, the majority did remember to give the correct units, cm^3, but some went on to attempt to convert this correct volume to m^3. Unfortunately this conversion to m^3 was poorly done with almost everyone who attempted the conversion offering $588.00m^3$ or $5.8800m^3$, rather than the correct $0.0588m^3$.
5	An interesting question where both the HCF and LCM were used in the same calculation. Seldom were the two values identified the wrong way round. The majority of candidates were able to gain 1 or 3 marks, with a significant number gaining 4 marks, and, to a lesser extent, the full 5 marks. Candidates were better at finding the HCF rather than the LCM. Those who gained 1 mark usually found a common factor, but not the HCF, of 36 and 54. If they found the HCF, they usually went on to gain the last B1 as well, for a FT of 'their LCM' ÷ 18 e.g. 2 ÷ 18 = 1/9. The remaining candidates tended to offer a common multiple, rather than the LCM, and then along with the correct HCF gained 4 or 5 marks.

Question	Comment
6(a).	This question, on changing the subject of the formula, was well answered. The majority of candidates who chose to expand the brackets on the LHS initially, gained at least 2 marks. Some candidates lost the final mark for making a slip after gaining the correct answer, e.g. after writing $x = (5y - 3)/2$ they went on to write $x = 2.5y - 3$. A significant number of candidates did use the alternative method of initially dividing both sides by 2 and then rearranging the equation. However, if this method was employed, a common error was to subtract y from the numerator instead of $2y$ leaving an incorrect answer of $y = (6y - 3)/2$. Again the majority of candidates seemed to gain 2 marks, but a lesser number gained the final mark from using this method.
6(b).	This was answered less well than part (a). Candidates generally got either 2 marks or 0 marks on this question. The candidates who got a correct answer tended to show the first and second differences, from which they understood that the *n*th term should include n^2. They invariably then were able to identify the '+ 2', for the full marks. Unfortunately, a significant number of candidates were at a loss, and offered a linear expression for the *n*th term.
7.	Candidates were generally competent on this question, most knowing that trigonometry was needed for both triangles. However, there was a significant minority who tried to incorporate Pythagoras on the upper triangle too. The first triangle required sine to find the hypotenuse. Although more candidates seemed to gain the correct answer than not, a significant number of candidates were unable to rearrange $\sin 38 = {}^{8}/_{QS}$ correctly to find QS, therefore only gaining the first M1. Even with an incorrectly derived QS, many candidates answered the second part well.
8(a).	Most candidates answered this question correctly.
8(b).	Having completed the tree diagram correctly, this follow up question was not well answered. Of the candidates who did gain the correct answer, they calculated all three separate branches and added them together or, to a lesser extent, used the quicker and more elegant solution of 1 − P(bus, 1st day). A few candidates rounded (or truncated) their multiplications of the individual probabilities too severely before summing, resulting in the final 0.42 being 0.419 in some cases. A great number of candidates gained either no marks, or the SC1 allowed for P(car, 1st day).
9(a).	This question was not well answered – candidates need to be taught what is meant by an identity, ≡, or a proof. The majority of candidates were able to expand the first pair of brackets $(10w + 3)(w - 1)$, but then were not sure how to deal with the $(2 - 3w)^2$ [a common mistake was $4 - 9w^2$] and/or the minus in front of this term. The majority of candidates gained the first B1 only, with only a few gaining all 4 marks for a convincing answer. For the answer to be convincing, candidates needed to deal correctly with the minus before the second expansion and not just assume the final result. $10w^2 - 7w - 3 - (4 - 12w + 9w^2) = w^2 + 5w - 7$ was a common answer but would gain only B1B1B0B0.
9(b).	This was a relatively simple quadratic equation to solve using the formula and in this question the b term was positive. However, a disappointing number of candidates did not answer it correctly. Although the quadratic equation is given on the formula sheet on the paper, candidates are still making careless errors with some still using trial and improvement techniques. A significant number are still not including the '$-b$' within the numerator of their formula, whereas others are incorrectly defining a, b and c. Although a good percentage of candidates are gaining full marks, we should expect a greater number to answer this question correctly.
10.	This was the worst answered question on the paper. This was partly because it required the candidate to prove logically (without making any assumptions at any stage of the proof) that the triangle was equilateral, but also because the candidate used incorrect terminology for angle properties. 'Alternate segment theorem' was used more extensively and correctly, but many candidates still used 'Z' angle instead of 'alternate' angle. If a valid attempt was made to explain why the first two angles within the triangle was 60°, then some candidates did gain the final mark for stating 'angles within a triangle (add to 180°)' or 'angles on a straight line (add to 180°)', or 'therefore equilateral'.
11.	This seemed to be a straight forward question on finding the surface area of a solid. Most candidates were able to utilise the given formula for the curved surface area of the cone, along with finding the area of the circular base. It was in finding the curved surface area of the cylinder which let most candidates down and a number confused surface area with volume by multiplying the circular base area by the height of the cylinder. Gaining 2 marks out of 4 was the most common result seen.

Question	Comment
12.	This was another question where the vast majority either gained all or no marks. The incorrect answers mainly involved calculating 137 ÷ 11 and then incorrectly finding a lower and upper bound for the answer. Another incorrect method often seen was to divide 137.5 ÷ 11.5. Of those candidates who did correctly divide 137.7 ÷ 10.5, most of them did round their answer correctly to 3 significant figures.
13.	This question was not answered well. Many candidates did appreciate calculating the probability for either 3 reds or 3 blues with replacement, but not both, which gained M1. Another common answer was assuming there was replacement which lead to 0.125 gaining no marks. However some continued and got the 1 mark SC1 for 0.25 which was for choosing the same colour for either all three red or blue with replacement.
14(a).	A number of candidates did not know the shape of the sine curve. Of those who did, they knew the sin curve should pass through (0, 0), (180, 0) and (360, 0), but a significant number of candidates failed to ensure that their curve passed through, or close to, (90, 1) and (270, -1) as the turning points, and that their curve had sufficient curvature at these turning points, meaning that they lost the mark available.
14(b)(i).	Again a varied response with the full 2 marks seldom awarded. A significant number were able to calculate $\sin^{-1}(0.3)$, and gained B1 for either 17°, 17.5° or 17.4(576…)°. Some candidates offered 18° here, and gained B0. However, the candidates who knew to look for a second solution, were usually able to get the second available mark for offering 180° – 'their angle'.
14(b)(ii).	Less candidates attempted this question than any other on the paper. A significant number of candidates offered embedded answers 'sin 270° – 1 = 0', which gained the B1. Candidates who used their calculator to solve $\sin^{-1}(-1)$ often left their answer as $x = -90°$, which did not gain the mark, as it was not within the given range.
15.	This question was poorly answered. The majority of candidates gained zero marks. They failed to realise that the linear scale factor was $\sqrt[3]{(3100/3970)}$ or $\sqrt[3]{3100}/\sqrt[3]{3970}$ (or its reciprocal), and were not able to go any further as they needed to work with their derived answer if allowed to gain any FT marks. Those who did gain credit for their work and calculated the linear scale factor, tended to gain all 3 marks, but this was seldom seen.
16.	This was a multiple choice question and not answered well. (a) There was evidence that candidates knew that this was a negative quadratic graph which suggested some degree of understanding, but not a complete recognition of the equation for the graph requiring a negative x^2 coefficient. The most common answers offered were the 2nd, 4th and 5th choices (with the 4th choice being the correct answer). (b) This part of the question was answered very poorly, with no discernible choice being offered more often than any other. Candidates should be encouraged to do some relevant calculations on the lines provided for some of the multiple choice questions, especially towards the end of the paper e.g. drawing a table of values for each graph for different values of x.
17.	This was a testing AO3 question, but was answered better than the A* questions 15 or 16. Although given a diagram which clearly showed the shaded region to be calculated, many candidates failed to get started on this question. A high proportion of candidates considered the triangle to be a right angled triangle which meant they either incorrectly derived x by using right-angle triangle trigonometry or worked out the area of the triangle to be 9 cm² from $(3 \times 6)/2$. Of the candidates who realised the need to use the cosine rule, many failed to correctly identify their *a*, *b* and *c* within the formula, and also lost these marks. Candidates were then offered a fresh start if they had derived an angle for x, from any calculation. Some candidates were able to identify the region BCD as the area of the sector minus the area of the triangle, and as long as they had some calculations for these areas and had attempted to subtract they then gained the first S1. The area of the sector was generally well answered, either using the correct angle at x, or on FT. Some candidates continued to think of the triangle as a right-angled triangle, whilst attempting to find its area, therefore losing a further M mark, whereas others now employed A = ½abSinC, and were able to gain the M1, and possibly A2 on FT.

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