Transcript for recorded event
Course title: Edexcel GCSE (9-1) Mathematics 1MA1 Higher: Feedback on June 2017
Event Code: 17OAM06

Slide	Purpose of Slide	Additional Information
Slide 1	Course Title	Welcome to the recording of the event which is designed to provide you feedback on our Edexcel GCSE (9-1) Mathematics 1MA1 specification Higher tier. My name is Karen and I am one of the senior examiners for this specification.
Slide 2	Agenda	I will first give you an introduction, a short overview of the assessment requirements for the GCSE (9-1) specification. We will then go through an overview of the responses of selected responses to the GCSE examination papers, and I will finish with summarising in the supporting resources that are available to yourselves.
Slide 3	Aims and Objectives	The aims and objectives of this session. By the end, you should have; • received feedback on national performance of candidates in the June 2017 examination series • considered the variation of candidates' performance on different questions and possible reasons why • discussed the Examiners' Reports • addressed common issues and frequently asked questions.
Slide 4	Assessment objectives	A reminder to ourselves of the assessment objectives, of which there are three. Each of these have strands and elements, which are all detailed in the specification, and every strand and every element must be assessed in every examination series. For assessment objective one, which is using and applying standard techniques, this covers 40% on the higher tier. Assessment objective two, reasoning, interpreting and communicating mathematically covers 30% on higher tier, and finally assessment objective three, solving problems with a much greater focus on solving non-routine problems in mathematical and non-mathematical contexts, is also 30% on the higher tier.
Slide 5	Grade Boundaries	Here we have an overview of the grade boundaries for the June 2017. Here each of the papers as we know is out of 80 marks. This overall table shows that this is 240, and the final table gives us the cumulative percentage by grade at each tier.
Slide 6	Paper 1H Non-calculator	We are going to start at looking at Paper 1H, the non-calculator paper.
Slide 7	Mark Distributions	Here you can see the mark distributions for this paper, with a mean mark of 37.5, and a modal mark of 29.

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Slide 8	General comments	I'm going to start with some general comments from the Principal Examiner's report on the first third of the paper. A significant minority of candidates found this paper difficult, and were clearly unprepared for some of the questions. In this reformed GCSE examination (approximately 20%) they would probably have been better entered at Foundation level, where accessing a greater number of marks would have given them a more rewarding, and probably productive, experience. Only 68% of students were able to multiply two decimal numbers together. 53% of students were able to show that two lines were parallel. Weakest areas included algebraic manipulation and derivation, percentage calculation and application of ratios and proportion. We're going to now look at a few questions from this paper and then summarise some further learning points. We will start with Question 5. This is a common question, so Question 5 on Paper 1H, and also Question 25 on Paper 1F.
Slide 9	Introduce common question Q5 1H Q25 1F	This is a routine problem that assesses the ability of students to translate problems in a non-mathematical context into a series of mathematical processes. This is within the specific contexts of Pythagoras and compound units. Students need to demonstrate knowledge and application of Pythagoras' Theorem. They also need to have some basic knowledge of proportion to enable them to find the overall weight of the parts. Typical problems involving Pythagoras' Theorem include students doubling instead of squaring and failing to find the square root. On a more basic level, not knowing the difference between finding a perimeter and finding the area within a rectangle was demonstrated in errors that even higher level students are seen to make. At the bottom of the slide we can see the national performance figures for this question. There are five marks in total, and the mean score was 3.29. 18% scored 0 marks 7% scored 1 mark 7% scored 2 marks 9% scored 3 marks 11% scored 4 marks And only 48% scored the full 5 marks

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Slide 10	Explanation of Marking of common Question Q5 1H Q25 1F	Analysing the mark scheme, we can see here that too many students know that Pythagoras is needed for this problem, but then go on to spoil the rest of their working by carrying out area, rather than perimeter calculations. For that reason the process of using Pythagoras to work out the length of the diagonal is marked separately, as made clear in the Special Case. The first Process mark is awarded for an intent to use Pythagoras; subsequent doubling will lose the second mark, but not the first. Both of the first two marks can be awarded on sight of 13, sometimes shown on the diagram. The remaining marks are then dependent on an attempt at Pythagoras. They are first for adding up all five lengths, including their length of the diagonal. The mark for multiplying by the 1.5 is an independent mark. That is, whatever they have done in the problem to this point, if they show evidence of multiplying any two lengths, by whatever means, by 1.5, this mark is awarded. This is the mark relating to proportion. It could be awarded either early or late in their process of solution. So students who work with area ($5 \times 12 = 60$) could still gain the 2 marks for Pythagoras, but would not gain the mark for × by 1.5 since they are not working with lengths.
Slide 11	Example of fully correct response	This is an example of a fully correct response.
Slide 12	Explanation of marks awarded for second response	Here you may wish to pause the recording whilst you see how many marks you can award this response, and then resume the recording when you're ready. This candidate would gain four marks. The student gains the first mark by starting $5^2 + 12^2$ They also gain the second mark for showing intent to work out $\sqrt{169}$ (they do not have to get to the 13 for this mark). There is evidence of multiplying at least two lengths by 1.5; this is done before any attempted addition of lengths. So the independent (4th) Process mark is given. The third (dependent) mark can be awarded since the first two marks have been gained, and since the student shows the intent to add the five lengths together, after the multiplication of 1.5. This is only intent, since they are still using $\sqrt{169}$ for the diagonal. But as the intent is clear the mark can be awarded. The final mark cannot be awarded since no answer is provided. So a total of 4 marks for this response.

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Slide 13	Explanation of marks awarded for third response	This is another response that you may wish to pause the recording and press play when you're ready to continue, once you've decided how many marks you would like to award. This candidate was awarded 2 marks. The first process mark for $5^2 + 12^2$, but the complete process is not seen for the second mark. Since the third Process mark is dependent on both the first and the second, this 3rd mark (for adding up the five lengths) cannot now be awarded. In actual fact, the student would not have got this mark anyway since 6 lengths are added. Their total length is multiplied by 1.5, so the (independent) 4th process mark can be awarded. So overall we have: P1 P0 P0 P1 A0 hence 2 marks.
Slide 14	Introduce Q7 1H and provide explanation of Marking.	We're now going to look at Question 7 on the non-calculator paper. This is a routine problem that assesses the ability of students to translate problems in a non-mathematical context into a mathematical process, in the context of statistics and a knowledge of mean calculations. It is essential for the students to start working with totals, so showing 30 multiplied by 60 or 20 multiplied by 54, or the numbers 1800 and 1080 is an essential first step. Students who do not take this first step will fail to gain any marks. We can see that the first mark is for working with totals, so showing 30 × 60 or 20 multiplied by 54, or the numbers 1800 and 1080 will get the first mark. Students who do not take this first step will fail to get any marks. The second mark is for the complete process. Some students will just do the subtraction without the division by 10; in this case the second mark should not be awarded. Again, on the bottom of the screen we can see out of the 3 marks, the mean score was 1.61, with 38% gaining zero marks, 11% 1 mark, 3% 2 marks, and 48% gaining all three marks.
Slide 15	Example of fully correct response	The first response here shows all the elements required by the mark scheme, and most importantly the correct answer. So just sight of the correct answer would have attracted the award of 3 marks.
Slide 16	Explanation of marks awarded for Response 2	This is a response where you may wish to pause the recording and press play when you're ready to continue. This candidate would have received 1 mark. The first process mark, which is awarded for 30 multiplied by 60, or 20 multiplied by 54, or either of the numbers 1800 or 1080. No further marks can be awarded since no answer is indicated and no subtraction is seen.

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Slide 17	Explanation of marks awarded for Response 3	Another response: again, you may wish to pause the recording, and continue when you are ready. This candidate would receive 2 marks. The first process mark is for either 60 multiplied by 30 or 54 multiplied by 20. The second process is for the complete process, ignoring any arithmetic errors. 740 shows that there has been a subtraction, even though there is no subtraction sign. The incorrect answer, 54 times by 20, as that was wrong, the accuracy mark is lost. Therefore the answer given is incorrect.
Slide 18	Introduce Q15 1H	We now move on to Question 15. Part (a) is a routine problem that assesses the ability of students to solve a problem that requires a series of processes within a mathematical context, in this case use of mensuration formulae, and also links several different parts of mathematics such as number work in the form of estimation, geometry formulae and algebra in being able to carry out substitution and manipulation. Part (b) assesses a specific requirement to evaluate the results obtained. It is most appropriate to have this question on the non-calculator paper. Students need to demonstrate knowledge of π, and the ability to approximate given figures. A common misconception in using formulae is to misrepresent values, for example working with r instead of 2r squared. Students will find questions as in part (b) challenging, since they are required to explain a concept in words, in some detail. Here at the bottom of the slide you can see the percentages, ranging from 37% with 0 marks, and only 4% with all 4 marks.
Slide 19	Provide explanation of mark scheme for Q15.	Looking at the mark scheme, Part (a), almost all students knew a value for π. Students who ignored the instruction to work out an estimate gained some marks for correct substitution where some manipulation was then done. A single value was needed for the answer; those who did not use an estimate for π usually gained 2 out of the 3 marks. A common error was to work with 5 rather than 5 squared. To gain the first mark they must not only substitute values but make at least one step at manipulation, which could be as simple as multiplying both sides by 3. For Part (b), this could be followed through even if the student made errors in part (a). A minimal response would be one that discusses how the numbers change by using their estimates, making some reference to both numerator and denominator. Some students did this by discussing the effect on the necessary division, without then needing to mention numerator or denominator.

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Slide 20	Example of fully correct response	Here, we have an example of a fully correct response. Part (a) the candidate has taken the correct formula, provided estimates, including an estimate for π, and then has rearranged the formula in terms of h, finally doing the calculations needed to arrive at a correct answer of 4 (although any answer in the range 3.5 to 4.5 would have been awarded 3 marks). In part (b) we can see that the answer refers to dividing, and also refers to the fact that they are dividing a bigger number by a smaller number. This is sufficient for the award of the mark for this part.
Slide 21	Explanation of marks awarded for Second Response	This second response, again you may wish to pause the recording. This candidate would receive 1 mark. The first method mark is awarded for the rearrangement of the formula, as shown by 98 ÷ a third of π. There is no estimation since all the numbers are kept in their original form, and the answer is wrong. So no further marks are awarded. For part (b), since the answer concludes "less", which is wrong, no marks can be awarded.
Slide 22	Explanation of marks awarded for Third Response	Final response for you to pause. Here, 2 marks can be awarded. The first method mark is given for substitution and indication of the rearrangement of the formula. The second method mark is given for using estimates indicated by the 300 and 25. Note that an able student may not show this working and jump straight to $\frac{12}{\pi}$; if this is seen then M2 was awarded. We have an incorrect answer, so no accuracy mark. And for part (b) again, since the answer concludes the word "less", which is incorrect, so no marks.
Slide 23	Introduce Q18 1H and provide explanation of Marking.	The next question we're going to look at is Question 18. This assesses the ability of a student to make and use connections between different parts of mathematics, unprompted. The two areas that are linked in this question are knowledge of the properties of a rhombus and coordinate geometry, specifically the equations of perpendicular lines. Knowledge of work on coordinate geometry is also necessary to arrive at the final equation. A common misconception was that the gradient of a perpendicular line will just be 2, or $-\frac{1}{2}$. Some students showed weaknesses in substituting to find the constant term. We can see that this question is out of 4 marks, and a mean score of 1.23. 61% gained 0 marks, whilst 24% gained 4 full marks.

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Slide 24	Example of fully correct response	Here we have a response that is fully correct and neatly laid out.
Slide 25	Explanation of marks awarded for second Response	This response is for you to pause and see how many marks you would like to award. 1 mark was awarded here. A good start is made since the student recognises that *AC* is perpendicular to DB, by a statement in the working space. This gets the first mark. There is no statement relating to $-\frac{1}{m}$ or any equivalent statement. The original gradient of $\frac{1}{2}$ is just changed to 2, which is incorrect. So no further marks can be awarded. There is a substitution into their equation $y = mx + c$ but note the mark for this step is dependent on the award of the first two marks, so cannot be awarded.
Slide 26	Explanation of marks awarded for Third Response	Again, you may wish to pause. This candidate was awarded 3 marks. The first process mark was for recognising the diagonals cross at a right angle, as shown on the diagram. The second process was for stating the gradient of $AC = -2$ And the next process mark for the substitution of $x = 5$ and $y = 11$ into the equation $y = -2x + c$ Unfortunately there is an error in this final step resulting in an incorrect answer being given, so they lose the accuracy mark.

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Slide 27	Introduce Question Q21 1H and provide explanation of Marking.	Question 21. This assesses the ability of students to present a formal geometrical proof, in this question related to congruent triangles. Common misconceptions arise out of the amount of detail that is required for a proof, including the final statement. It is usual to expect statement to be justified by reasoning, unless that detail is given in the question. By looking at the mark scheme the link to *AC* and *BD* was used of the triangles *ABC* and *DCB*. Students have to be working with these triangles, and realise that in order to prove *AC* = *BD*, they have to prove that these two triangles are congruent, by the usual route. Proof of congruency requires three connections. Two of these were given in the question, but of course required re-stating as part of the proof, for one mark each. One for example was not stated, but could be deduced from the diagram, and therefore also needed stating for another mark. A variety of words were accepted in describing these lengths as "being the same". The final mark was reserved for awarding when a complete proof was presented, and a complete final statement. This meant that the three previous marks had to have been given, for the final statement needed to include a reference to *ABC* being congruent to *DCB*, SAS, and the final deduction that *AC* was therefore equal to *BD*. We can see at the bottom of the screen that for full marks the mean score was 0.85, with 51% scoring 0 marks, and only 4% gaining all 4 marks.
Slide 28	Example of fully correct response	Here, we've included an example of a fully correct solution. The three reasons for congruency are given. There is then a concluding statement, stating that *ABC* is congruent to *BCD*, giving the reason for congruency (SAS) and concluding *AC* = *BD*. All these elements need to be present to award the final mark.
Slide 29	Explanation of marks awarded for Second Response	A response for you to see how many marks you would like to award, so you may wish to pause. 3 marks are awarded here. This is an almost correct solution, but for the fact the student does not identify the two triangles ABC and DCB as being congruent (merely stating SAS was considered insufficient and must come alongside a formal statement of congruency).
Slide 30	Explanation of marks awarded for third Response	Again you may wish to pause the recording. This candidate received a mark of 1. The communication mark is awarded for the statement "AB = CD". A solution based on comparing the triangles BAD and CDA is incorrect; hence so is the statement "AD shared". The final Communication mark can only be awarded if a complete proof is presented, including three correct statements justifying congruency. So overall this is only worth 1 mark.

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Slide 31	Summary	So based on the performance on this paper, 1H, students should: - Present their work logically and in an organised way on the page, sufficient that the order of the process of solution is clear and unambiguous - Include working out for all questions where appropriate - Practice their arithmetic skills and learn multiplication tables. These are essentially particular on a non-calculator paper.
Slide 32	Summary	Some further points: - Practice algebraic manipulation, percentage calculations and application of ratios and proportion - And spend more time reading the fine detail of the question, and avoid giving answers that do not answer the question.
Slide 33	Paper 2H Calculator	We're now going to move onto the first of the calculator papers – paper 2H
Slide 34	Mark Distributions	We have a similar graph here which shows the mark distributions for this examination series. We can see that the mean mark is 35.7, and a modal mark of 37 on this paper.
Slide 35	General Comments	Here is some feedback from the Principal Examiner's report on the first third of the paper. • In a number of questions, the word "estimate" was taken in a different context to that intended and many solutions contained approximated values. This was particularly evident in first question of probability, cumulative frequency and histogram questions. • Consequently only 59% of students gained full marks on first question. • 52% failed to score any marks in similarity questions • And approximately 40% of students were able to gain at least half marks in dealing with compound measures. • There was a clear lack of understanding in combination of transformations with only 17% scoring zero marks, and 37% of students gaining one mark.

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Slide 36	Introduce Q10 2H	We're going to start by looking at Question 10. Part (a). This assesses the understanding of the ordering of numbers written in Standard Form. The most common mistake made is to select Uranus, choosing the largest number (8.683) and ignoring the powers of 10 Part (b): Simple calculation in Standard Form. This is most successfully done by those able to use extended functions of a scientific calculator. The most common error again is ignoring place value determined by the powers of 10; the incorrect answer of 1.567 was common. For Part (c), again this part centres on the students' ability to calculate with numbers in Standard Form. Those comfortable in the use of their calculator would simply divide the two values to get 105.07. Students need also to remember to actually answer the question, "Is Nishat correct?" Some students will recognise that 10^9 is 100 times greater than 10 to the power of 7. However for credit to be given a comparison between 4.35 and 4.14 was also required.
Slide 37	Provide explanation of mark scheme for Qu 10 2H	We can see looking at the mark scheme for part (c), it is important that an answer of "yes" was explicitly stated supported by correct working. It is not sufficient simply to say that Nishat is correct because 109 has two more zeros than 107. Again we can see here that the mean scores and the marks, percentage of marks gained by the cohort.
Slide 38	Example of fully correct response	This is an example of a fully correct response. Part (b), the student demonstrates a complete understanding of Standard Form, initially converting 3.302×10^{23} to 0.3302×10^{24} to make it consistent with the other value. In part (c), perfect use of a calculator and simply writing 'yes' was sufficient.
Slide 39	Explanation of marks awarded for second response	You may wish to pause the recording, to have a look at this response. This candidate was awarded 3 marks. In part (a), answer is correct but it is 1.898×10^{27} and not 'Jupiter' that gets the mark. In part (b), the answer is clearly found by accurate use of their calculator. And in part (c), working is correct but the answer of 1.05×10^{16} is not correct.

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Slide 40	Explanation of marks awarded for third response	Another response for you to have a look at. Here, 1 mark is awarded. A good start is made with a correct answer to part (a). In part (b), again a good start is made, converting the mass of Mercury to 0.3302 × 10 to the power of 24, but then the final answer is incomplete since the power of 10 has been omitted. When answering part (c), this student is simply trying to find the difference in the distances of the two planets from Earth and not answering the question. Misinterpretation of questions is one of the major reasons for students to lose marks.
Slide 41	Introduce Q11 2H and provide explanation of marking.	Moving onto Question 11, there are 3 possible method marks in this question; one for how to write two algebraic fractions with a common denominator, one for eliminating the fractions to give a linear equation and finally one mark for isolating terms in x and the number terms. The inclusion of a negative sign between the first two fractions prevented many students completing an accurate solution. When eliminating the fractions, students need to say explicitly what they are doing, e.g. multiplying both sides of the equation by 12. A common misconception is to multiply **both the** numerator and the denominator by a common multiple. This question assesses the students' ability to solve an equation with fractions. Students differed in the stage at which they removed the fractions. In order to treat all students equally, errors were allowed in the expansion of brackets as any errors made would already be penalised by the loss of the accuracy mark. Quite often the elimination of the fractions is not seen until later stages in the solution. The third method mark is dependent on a previously correct method seen. An unsimplified answer of say $\frac{28}{3}$ or $\frac{168}{18}$ is perfectly acceptable even if subsequent simplification is incorrect; the question is not assessing the simplification of fractions. Again, we can see out of 4 marks, the mean score was 1.32, and 43% gained no marks, with only 15% gaining all 4 marks.
Slide 42	Example of fully correct response	Here we have an example of a fully correct response.

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Slide 43	Explanation of marks awarded for Second Response	Moving onto the second response, if again you would like to pause, whilst you decide how many marks. In this solution we see a correct start, writing the first two fractions with a common denominator of 12. The expansion although not seen is carried out correctly giving two correct numerators. The fraction $\frac{(x-26)}{12}$ is correct but this is then ignored and a second (incorrect) attempt is made. However, the student never returns to the question to equate either of their results to $\frac{(1-x)}{6}$ so no more credit is given.
Slide 44	Explanation of marks awarded for third Response	And finally, again you may wish to pause. Here a total of 3 marks can be awarded. This exemplifies the very common mistake when subtracting the $4(2x + 5)$ of the second fraction. The + 20 should of course be –20 and but for this error, with all algebraic manipulation correct, the correct answer would have been found. So 3 marks awarded.
Slide 45	Introduce Qu 18 2H	Moving onto Question 18. This is a high level question assessing the understanding of the rule of indices; requiring each element of the equation to be written in the same base – ideally a base of 2 – thus developing a linear equation to be solved for x. Since students had access to their calculators, many divided to find a numerical value of 2^x but were then unable to go any further. Some did try to use trial and improvement techniques with some success. Some more able students used logarithmic techniques using concepts beyond the remit of this specification. A common misconception was to write $16^{\frac{1}{5}}$ and $8^{\frac{3}{4}}$ as the mixed fractions as $16\frac{1}{5}$ and $8\frac{3}{4}$ respectively. The mean score for this question was 0.71, and 62% gained no marks.
Slide 46	Qu 18 2H provide explanation of mark scheme	There are two discrete mark schemes for this question reflecting the algebraic and numerical approaches. In the first scheme, the second process mark, showing an understanding of the index laws, is dependent upon the award of the first mark for a start to convert to a common base. The second scheme is to cater for a non-algebraic approach. Here there is just one process mark with the remaining two marks for a correct final answer.
Slide 47	Example of fully correct response	This is an example of a fully correct response. This solution is set out clearly, showing conversion to base 2 on the first line, a correct application of index laws in lines 2 and 3 followed by a correct value for x from their linear equation.

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Slide 48	Explanation of marks awarded for second response	You may wish to pause the recording. 1 mark was awarded here. This attempt follows the numerical route and a correct start is made in finding the value of 2^x. The solution then gains no further ground as the student does not know how to deal with an equation in 2^x.
Slide 49	Explanation of marks awarded for third response	The final response for this question, again you may wish to pause. Again, 1 mark is awarded here. The student correctly converts each element to a base of 2, followed by a correct use of the index law $\left(x^m\right)^n = x^{mn}$. The one mistake then made is to divide the two powers instead of finding the difference.
Slide 50	Introduce Qu 21 2H .	Question 21. This is probably the most demanding question on the paper requiring students to explore possible methods of finding the dimensions of the rectangle. The length of 24 × 4 = 96 mm is relatively straightforward but the width needs a great deal more thought. Many students simply assumed it was a square of a side 96 mm. Others found areas of the three circles. The centres of the circles were shown to encourage students to draw an equilateral triangle from which the height could then be found. Out of the 4 marks we can see that the mean score is 0.74, 40% scored no marks, 55% 1 mark, half a percent was 2 marks, half a percent three marks, and 4% all 4 marks.
Slide 51	Qu 21 2H provide an explanation of mark scheme	To gain the first process mark, it must be clear that the 96 mm refers to the length and not the width of the rectangle. The third process mark is only for a process leading to find the width of the rectangle; it is not for the complete process to find the area.
Slide 52	Example of fully correct response	Here we have an example of a fully correct response. We can see the diagram clearly shows the equilateral triangle and the height needing to be found. Pythagoras or trigonometry of a right-angle triangle may have been more efficient ways to find the height but this student demonstrates total understanding of the theory for the area of a triangle.

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Slide 53	Explanation of marks awarded for second response	You may wish to pause the recording for this response. 2 marks were awarded here. This solution lacks a significant amount of explanation which could have led to a final correct answer. The height of the equilateral triangle is shown in the diagram to be $24\sqrt{3}$. This is correct and with the length of 96 mm clearly shown, the first two process marks have been awarded. But then instead of adding 24 × 2 to this height, the student simply doubles it and multiplies by the length to give their incorrect answer. A little bit more care, with working shown, could have given the required answer.
Slide 54	Explanation of marks awarded for third response	Another response with which you may wish to pause. Only 1 mark was awarded here. This is the most common mistake made and the modal answer for this question. The length is clearly identified as 96 mm and then it is assumed the shape is a square. Once again, even in this high-level, demanding question, an easy mark is available for students who interpret the information given and make a start towards a solution. Unfortunately many students made no attempt to answer this question.
Slide 55	Summary	I'm now going to just summarise, and so based on the performance of this paper 2H, students need to: - Set out their solutions in a logical manner, showing all necessary working - Learn to differentiate between simple and compound interest - Ensure they read the question carefully and their final answer answers the question that has been set - Learn the sine and cosine rule and how to use these correctly, relabeling the sides and angles of a triangle if necessary - And finally, to practice working with histograms.
Slide 56	Paper 3H Calculator	We're now going to move onto the second calculator paper, 3H.
Slide 57	Mark Distributions	And here we have the mark distributions for this examination series. We can see that the mean mark was 38.5 and the modal mark for this paper was 28.

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Slide 58	General Comments	Here are some comments from the Principal Examiner's report on this paper. The standard of work seen was good in places but students are reminded to show full working out and to form numbers clearly. At times, some work was very difficult to read and students even found it difficult to read their own writing as evidenced by the transferral of incorrect figures from one part of the question to another. As this is a new specification some students seemed to think that each question would be a problem and over complicated the questions. Centres should remind students that some questions will be straight forward tests of knowledge. Centres are advised to try to balance the teaching of standard procedures with problem solving techniques. Marks were lost through not reading the question with sufficient care. Some questions required a decision to be made and marks were lost unnecessarily because students failed to state a conclusion. 74% gained over half marks on the first question, that's the Venn Diagram. 73% of students were able to successfully calculate the median from a table. We're now going to have a closer look at some of the questions
Slide 59	Introduce Common Question Q4 3H Q18 3F	And we're going to start with the first common question, which is Question 4 on paper 3H, and Question 18 on paper 3F. This question assesses the students' ability to find both a fractional amount of 420 and also a percentage of 420. These two figures then need to be used in the next step of this multi-step problem. After a subtraction the remaining quantity then needs to be split into a given ratio. This is an example of a problem using connections between different parts of maths. It is important that students show all the steps in their working out as process marks can be awarded even if the intermediate answers are not correct. On a calculator paper it is better if students do not use a break down method to find the percentage as students often make an arithmetic error in this approach. 5 marks for this question with a mean score of 4.44. 2% gaining 0 marks, 4% 1 mark, again 4% 2 marks, 8% for 3 marks, 3% gained 4 marks, and 79% gained all 5 marks.
Slide 60	Given an explanation of mark scheme for common question Q4 3H Q18 3F	Looking at the mark scheme, we can see that the third mark uses the new notation of (vanilla cakes). This means that we can follow through on any stated number of vanilla or banana cakes as long as 1 previous process mark has been awarded. This enables students to still score 3 out of the 5 marks even if they make an early error in this question.
Slide 61	Example of fully correct response	This is a perfectly presented solution. The student presents 68 correctly and also works out 85, which is not required but does show full understanding of the problem set.

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Slide 62	Explanation of marks awarded for second response	Another response for which you may wish to pause the recording. This candidate gained 3 marks. Everything is correct until the final process. The first mark is for the process working with $\frac{2}{7}$ They get a process mark for working with the percentage. They get a process mark to find number of lemon/chocolate cakes. But they lose the process, it's an incorrect one for the ratios. So 3 marks in total.
Slide 63	Explanation of marks awarded for third response	Again you may wish to pause the recording. Here, 2 marks can be awarded. The correct process for vanilla cakes has been done. The process for banana cakes is incorrect as the student has found 35% of 300, not 420. However, as they have previously scored a process mark, we can award the third process mark for 420 – (vanilla cakes) – (their banana cakes). There is no further working, so no more marks can be awarded as the student has not attempted to find $\frac{4}{9}$ of this total.
Slide 64	Introduce Qu 5 3H	Moving onto Question 5. This question assesses the interior and exterior angles of polygons. The students should be able to find the angles of a regular 12 sided shape either by knowing the formula for the exterior angles or the sum of the interior angle and dividing by 12. From this point on they can then use the fact that a square has a right angle and that angles in a straight line add up to 180 degrees or angles around a point add up to 360. This should give the student the interior or exterior angle of polygon P. It is now important that the student uses this information about a hexagon to test the angle they have found with the equivalent angle in a hexagon. The angle MUST be found in two ways for the final communication mark to be awarded. This question requires the student to construct a chain of reasoning to achieve a given result. For 4 marks the mean score was 2.12, with 36% scoring 0 marks, and 41% scoring all the marks available.
Slide 65	Explanation of Mark scheme Q5 3H	Looking at the mark schemes, students can find relevant angles and if they find them accurately they can have 3 marks. The final mark is given for the standard of the communication and bringing together all the parts of the question.

Slide	Purpose of Slide	Additional Information
Slide 66	Example of fully correct response	Here we have an example of a fully correct response, which is clearly explained. The student shows the interior angle of polygon P to be 120 degrees. They also show that a hexagon has an interior angle of 120 degrees and so full marks can be awarded.
Slide 67	Explanation of marks awarded for second response	You may wish to pause the recording. The first method mark can be awarded here. The initial work on the dodecagon is incorrect, as they have used 1440 instead of 1800. No method to 1440 is seen. Any figure quoted must be correct. However $120 \times 6 = 720$ and the interior angle of a hexagon is 120 is stated. This is sufficient for a method mark. No other marks can be awarded.
Slide 68	Explanation of marks awarded for third response	The final response for this question, again you may wish to pause. 3 marks can be awarded here. The student finds 2 of the required angles accurately so can be awarded 3 marks. There is no correct explanation or connection to angles in a hexagon so no further marks can be awarded.
Slide 69	Introduce Qu13 3H	We're now going to move onto Question 13. This is a reverse region question. It assesses the interpretation and communication of information in an accurate nature. The students need to write down a relationship to describe each line and any equality or inequality is acceptable for the initial marks. The last mark is for the final accuracy of the inequalities. Some students failed to write down any lines but just gave the points at the vertices. Another regular mistake seen was to mix up the x and y in the equations. Especially giving $x > -2$ instead of $y \geq -2$ The mean score for this question was 1.37, and 40% of candidates scored no marks, and only 7% scored all 4 available marks.
Slide 70	Explanation of mark scheme of Qu13 3H	Looking at the mark scheme, 1 mark for each line separately and looking also for equivalent answers could be awarded. You only consider the inequalities for the last mark assuming all the method marks have been awarded.
Slide 71	Example of fully correct response	Here we have an example of a fully correct response, showing the equations of the lines and the correct inequalities. The order of the inequalities on the answer lines is not important.

Slide	Purpose of Slide	Additional Information
Slide 72	Explanation of marks awarded for second response	You may wish to pause the recording. 2 marks were awarded here. A relationship between y and -2 is stated so one method mark A relationship between y and x is stated so another method mark. The gradient on the other line is incorrect, so no more marks can be awarded. 2 marks in total.
Slide 73	Explanation of marks awarded for third response	Final response for this question, again you may wish to pause. 3 marks can be awarded here. All the lines have been identified but the inequalities are not all correct.
Slide 74	Introduce Qu 18 3H	We're now going to look at Question 18. This question assesses connections in mathematics in a mathematical style problem. There is an initial need to know that the angle between a tangent and radius is 90°, and then use trigonometry to find an angle and then combine this work with the circumference of a circle to find an arc length. Students sometimes found the area of the circle rather than the circumference. Others found the arc length of the minor arc. The complexity of this problem did prove difficult for some students and some used Pythagoras' theorem to find the missing length in the triangle. Unfortunately, this does not help with the solution of the problem. The use of inverse trigonometry is key to solving this problem. The mean score for this question was 1.57, and 41% scored no marks, and 18% scored all 5 marks.
Slide 75	Explain mark scheme for Qu 18 3H	The marks in this mark scheme are progressive. The use of "56.25" indicates this angle must come from a correct process. The right-angled triangles are symmetrical in the diagram, so students could find any appropriate angle and still gain marks. Note: the use of an example in the mark scheme and the note shown below the mark scheme here.
Slide 76	Example of fully correct response	Here is an example of a fully correct response. This example uses the sine rule to find the angle at the centre of the circle. The right angle is shown and the correct equation is seen. Then inverse sine is used and they continue to show a complete method. The answer is within the range given on the mark scheme and so the accuracy mark is also awarded.

Slide	Purpose of Slide	Additional Information
Slide 77	Explanation of marks awarded for second response	You may wish to pause the recording while you see how many marks would be awarded for this student. 1 mark can be awarded here. The angle 90 degrees is clearly shown on the diagram so the first mark is awarded. Pythagoras' theorem is used correctly here but this is not needed for the solution of the question so no marks are awarded. In addition there is no attempt at using trigonometry to find one of the required angles so no more marks can be awarded.
Slide 78	Explanation of marks awarded for third response	Again, you may wish to pause the recording. 3 marks can be awarded here. This student begins well. They use the right angle symbol, trigonometry to set up an acceptable equation and use inverse trigonometry to find the angle. Unfortunately, there is no complete valid method to calculate the length of an arc. So only the first 3 process marks can be awarded.
Slide 79	Introduce Question 20 3H	Moving onto the final question, Question 20b. This question assesses the interpretation of an exponential equation in a graphical concept and the translation of a function. The first part is Assessment Objective 1 and a standard operation, whilst part (b), here, is about interpreting and communicating information accurately. The main misconception seen was to translate in the circle 3 units parallel to the *y*-axis'. Whilst the biggest error was to label points on the *x*-axis in the wrong order so for example (3, 0) was often given as (0, 3). The maximum mark for this question was 3, with 66% of students gaining no marks, only 11% gaining 1 mark, 4% 2 marks, and 19% 3 marks.
Slide 80	Explanation of mark scheme for Question 20 3H	Looking at the mark scheme, please note the "or" and the "and" in marks 1 and 2, here. The first mark can be awarded for a start, for example one correct skill seen. The second mark requires the student to begin to combine the skills required. And the final mark is for a fully correct answer and this must include labels in some format that do not conflict.
Slide 81	Example of fully correct response	This, here we have a fully correct circle is drawn. The labelling is clear and the radius can clearly be implied by the diagram. An accurate circle was not a requirement, a freehand sketch was acceptable. Here we can award 3 marks.

Slide	Purpose of Slide	Additional Information
Slide 82	Explanation of marks awarded for second response	Again, you may wish to pause the recording. 2 marks can be awarded here. The diagram is correct, however the labels on the intersection with the *x*-axis are incorrect, the order of the coordinates have been reversed. For full marks in the diagram must be fully correct, so only 2 marks here.
Slide 83	Explanation of marks awarded for third response	And the final response, again you may wish to pause the recording. 1 mark can be awarded here. This diagram draws a circle of the correct size but all the labelling is incorrect. So 1 mark is awarded for the correct sized circle.
Slide 84	Summary	So to summarise some points from paper 3H. - Candidates should show their working and not just use a calculator and then write down the answer only. - They need to be encouraged to check their arithmetic carefully, particularly when negative numbers are involved. - They need to learn all formulae appropriate to this tier of entry - Be able to draw a diagram when one is not provided for a geometry question, to aid the understanding of a situation. - Ensure that the conventional three label lettering is used to identify angles in geometry questions. I'm now going to go through and finish off by going through some support and resources which are available to yourselves and centres.
Slide 85	Content support	A reminder that all these resources are available on the emporium and on the website. So we start with the content support. Here you have content guidance and the teaching guidance, which is a very comprehensive guide. We have exemplification documents, which are questions given within the specification, and assessment objective referenced, along with questions either new to the specification or new to the foundation. We also have a number of documents which are exemplar student answers with examiner comments.
Slide 86	Support for new content	Support for new content. There are sample questions for new topics, there is new content resource, and there's new content delivery. And again these are recorded sessions for different areas of the new content to the specification, delivered by a practicing teacher.

Slide	Purpose of Slide	Additional Information
Slide 87	Problem solving and reasoning	A number of resources are available for problem-solving and reasoning. We have the practice papers, gold, silver, bronze. We have problem solving papers, again written with bronze and silver versions. There is further support to do with the trial, to do with the reasoning, assessment objective 2, and assessment objective 3, problem solving and trial support materials.
Slide 88	Tiering support	Finally there is tiering support. There is a document which explains about guidance to do with tiering. There are common question papers, there's are a wide variety of sample assessment materials, there are specimen paper sets, there are practice sets and there are themed papers.
Slide 89	Mock service	Moving onto mock service. We know how important it is for your students to be able to sit mock exam papers that they haven't previously seen in preparation for the GCSE (9-1). So last year two sets of mock papers were provided in autumn 2016 and spring 2017. Another release of mock papers will be due in autumn 2017 and another one in autumn 2018.
Slide 90	Mocks marking training events	Last year some mock marking training events were ran in the autumn 2016, which were done to help you apply the new mark schemes, so that you can be confident you're getting a clearer picture of your students' achievements. Videos from the foundation and higher tier events and the training documents are available to download from our website.
Slide 91	Useful links	This slide here has some other useful links. Grade boundaries, examination results statistics, access to scripts in real time, and also results plus. Below your screen at the bottom of the screen you have a delegate download pack, and therefore if you clicked on this slide you will also then go to these links.
Slide 92	Networks	Finally just to remind you the other support out there is your mathematics collaborative networks. And these are free local teaching networks which are to help support, train and share best practice with other maths teachers and heads of department across the country.
Slide 93	Maths Emporium	Finally to remind you about the mathematics emporium, the website and you can sign up to the email updates. All the resources that I've mentioned previously all can be found in the emporium.
Slide 94	Subject advisor	And finally our subject adviser Graham Cumming, you can follow him on his twitter account or email him at teachingmaths@pearson.com
Slide 95		I hope you found this recording useful. Thank you for listening, and good luck to your centres.