

**Summer 2017 Edexcel GCSE Maths  
Topics New to Higher Tier - Performance and Action Points**

Several topics were new to GCSE Maths Higher tier this year and there were changes in the emphasis of topics.

This analysis identifies how students performed in questions on these topics in this year's examinations. Action points are provided for teachers to consider how students might improve in these areas next year.

This has been compiled using the exam reports and feedback provided by Edexcel<sup>1,2</sup>.

### **Topics New to Higher Tier**

The following topics were new to Higher tier GCSE Maths this year:

#### **NUMBER**

- Error intervals
- Product rule

#### **ALGEBRA**

- Expanding three brackets
- Functions, Inverse functions and Composite functions
- Identifying turning points (graphically)
- Identifying turning points (by completing the square)
- Gradients of graphs
- Areas under graphs
- Fibonacci type sequences
- Geometric sequences
- nth term of a quadratic sequence
- Roots of equations
- Iteration

#### **RATIO, PROPORTION AND RATES OF CHANGE**

- Ratio and Proportion \*There was a greater emphasis in this content. Ratio and Proportion is considered in a separate analysis

#### **GEOMETRY AND MEASURES**

- Standard trigonometric values

#### **PROBABILITY**

- Venn diagrams and Set Notation

**Performance in New Topics**

For each new topic, the paper and question number is given of where this featured. The performance is a summation of the feedback provided by Edexcel<sup>1,2</sup>. Only the performance and action points for the part of the question that is relevant to the new topic are given.

**NUMBER**

<b>New Topic</b>	<b>Paper / Ques. No.</b>	<b>Performance and Action Points</b>
Error intervals	2H Q7	<p>There was evidence that many students had never covered this topic.</p> <p><b>Action Points:</b></p> <ul style="list-style-type: none"> <li>• Ensure this topic is covered fully with students. Do not assume understanding because this may appear to be a straight forward topic.</li> <li>• Ensure students understand how to write inequalities correctly (don't write them the wrong way around).</li> <li>• Highlight the following misconception: finding the difference between the lower and upper bounds, instead of writing an inequality for an error interval. Perhaps the use of the word "interval" causes this confusion.</li> </ul>
Product rule	3H Q11	<p>Examiners were generally pleased with the response to this question. One of the main errors was no interpretation following a correct calculation. The following action point applies to this topic and all others.</p> <p><b>Action Points:</b></p> <ul style="list-style-type: none"> <li>• Students need to know that a calculation alone where interpretation is required is not sufficient for full marks. Teachers should spend time with students identifying the phrasing that is commonly used in questions to indicate that interpretation is required.</li> </ul>

**ALGEBRA**

<b>New Topic</b>	<b>Paper / Ques. No.</b>	<b>Performance and Action Points</b>
Expanding three brackets	1H Q10	<p>Expanding the first pair of brackets was usually done well and, in general, students were then able to go on to complete the full expansion correctly.</p> <p><b>Action Points:</b></p> <ul style="list-style-type: none"> <li>• Reinforce with students for them not to try multiplying all three brackets at once.</li> </ul>

New Topic	Paper / Ques. No.	Performance and Action Points
		<ul style="list-style-type: none"> <li>Once two brackets have been expanded, work <u>systematically</u> to multiply the three terms. Examiners report that this increases accuracy and likelihood of a correct answer.</li> <li>Remind students to take care copying their own working in these multi-staged questions.</li> </ul>
Functions, Inverse functions and Composite functions	1H Q11	<p>Understanding the notation for <math>f(a)</math> where the value of <math>a</math> is given was not understood well by a significant minority.</p> <p><b>Action Points:</b></p> <ul style="list-style-type: none"> <li>Ensure students have a secure understanding of function notation, stating with the most basic. This is possibly overlooked before moving on to teaching more advanced work with functions.</li> </ul>
Identifying turning points (graphically)	1H Q11	Writing the coordinates of the turning point was done well.
Identifying turning points (by completing the square)	Not assessed	
Gradients of graphs	2H Q20	<p>Drawing tangents to curves was done well.</p> <p><b>Action Points:</b></p> <ul style="list-style-type: none"> <li>Make students aware of the following common errors when drawing a tangent: it does not need to go through the origin necessarily; drawing a chord gains no marks.</li> <li>Teachers should be aware that using calculus is not part of the specification for calculating a tangent, but used correctly this results in full marks (unless the question specifically states a tangent is to be drawn).</li> </ul>
Areas under graphs	Not assessed	
Fibonacci type sequences	Not assessed	
Geometric sequences	Not assessed	
$n$ th term of a quadratic sequence	2H Q22	<p>Generally, this was answered very well.</p> <p><b>Action Points:</b></p> <ul style="list-style-type: none"> <li>Students must remember to halve the second difference for the coefficient of <math>n^2</math>.</li> <li>Teachers may teach the <i>differencing</i> approach or <i>simultaneous equations</i> as an alternative method. If their own students struggle with the <i>differencing</i> approach, they should be aware that some students used this latter method successfully.</li> </ul>
Roots of equations	1H Q11	<p>Finding the roots as where the graph crosses the <math>x</math>-axis was well-understood.</p> <p><b>Action Points:</b></p>

New Topic	Paper / Ques. No.	Performance and Action Points
	3H Q16	<ul style="list-style-type: none"> <li>• Clearly instruct students not to write coordinates for the roots of a function.</li> <li>• Remind students of the common basic errors when reading of graphs: reading the scale incorrectly; not writing a negative sign when it is needed.</li> </ul> <p>Many students did not correctly identify that iteration converges to the roots of the equation.</p> <p><b>Action Points:</b></p> <ul style="list-style-type: none"> <li>• Make sure students understand that the iterative formula is a rearranged form of the equation.</li> <li>• During teaching of this topic, highlight with students the common misconception that each step of the iteration is a solution of the equation.</li> </ul>
Iteration	3H Q16	<p>Not all candidates even attempted this question, leading to question that this topic had been covered.</p> <p><b>Action Points:</b></p> <ul style="list-style-type: none"> <li>• Ensure this topic is covered fully with students.</li> <li>• Remind students to show all their working out, including for questions like iteration which are done on the calculator. They can learn from the mistakes of past GCSE students who have misused their calculator, shown no working, and earned no marks.</li> <li>• Students should be encouraged to use brackets with negative numbers on their calculator to avoid errors, such as the incorrect squaring of negative numbers.</li> </ul>

## RATIO, PROPORTION AND RATES OF CHANGE

There is a greater emphasis in this content in the new GCSE 9-1 specification, therefore Ratio and Proportion is considered in a separate analysis.

## GEOMETRY AND MEASURES

New Topic	Paper / Ques. No.	Performance and Action Points
Standard trigonometric values	1H Q22	Standard trigonometric values featured as part of a challenging problem set for grade 9 students at the end of the paper. Not all students were able to write down the exact trigonometric value required.

		<p><b>Action Points:</b></p> <ul style="list-style-type: none"> <li>Students need to learn the exact trigonometric values for <math>0^\circ</math>, <math>30^\circ</math>, <math>45^\circ</math>, <math>60^\circ</math> and <math>90^\circ</math> (or how to be able to quickly recall these using a diagram and Pythagoras, which is easier!).</li> </ul>
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## PROBABILITY

New Topic	Paper / Ques. No.	Performance and Action Points
Venn diagrams and Set Notation	3H Q1	<p>This question involved a Venn diagram and understanding set notation. The most common score for this question was two-thirds of the total marks.</p> <p><b>Action Points:</b></p> <ul style="list-style-type: none"> <li>Students must not forget to write all the remaining numbers in the universal set (a common error).</li> <li>Ensure that students know marks are lost when labels are not used.</li> <li>Students should know that examiners report the students who perform best tick off all the potential values when completing a Venn diagram.</li> </ul>

### Disclaimer

All efforts have been made to represent, accurately, the feedback provided by Edexcel<sup>1,2</sup>. Edexcel's examiner's reports included points of consideration for exam centres, some of which have been included as the bulleted action points above, whilst some of the action points represented here are the views of the author.

**References**

1. Chief Examiner's Report Summer 2017, Pearson Edexcel GCSE (9-1) Mathematics (1MA1)
2. Principal Examiner's Feedback Summer 2017 Higher Papers, Pearson Edexcel GCSE (9-1) Mathematics (1MA1)