

Topics New to Foundation Tier - Performance and Action Points

There were many new topics to GCSE Maths Foundation tier this year. Here we look at how students performed in questions on these new topics and we have provided action points to help your students improve in these areas.

This has been compiled using Edexcel's^{1,2} exam reports.

Topics New to Foundation Tier

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

NUMBER

- Error intervals
- Zero and negative powers (numerical)
- Standard form

ALGEBRA

- Zero and negative powers (algebraic)
- Fibonacci type sequences
- Quadratic sequences
- Geometric sequences
- Expanding two brackets
- Factorise quadratics of the form $x^2 + bx + c$
- Solve quadratic equations by factorising
- Solve linear simultaneous equations
- Identifying turning points (graphically)
- Plot and recognise cubic and reciprocal graphs
- Roots of equations

RATIO, PROPORTION AND RATES OF CHANGE

- Compound interest and reverse percentages
- Direct and indirect proportion (numeric and algebraic)
- Relate ratios to linear functions
- Gradient of a straight-line graph as rate of change
- Ratio and Proportion *There was a far greater emphasis of this topic in the new GCSE. Due to its increased significance, we will consider Ratio and Proportion in a separate analysis.

GEOMETRY AND MEASURES

- Arc lengths
- Areas of sectors
- Fractional scale factors in enlargements
- Trigonometry in 2D
- Vectors
- Standard trigonometric values

PROBABILITY

- Tree diagrams
- Venn diagrams

Performance in New Topics

For each topic, the paper and question number of where this featured is given. The performance is a summation of the feedback provided by Edexcel^{1,2}. Under performance and action points, we've focussed only on those aspects of the question that are relevant to the new topic.

NUMBER

New Topic	Paper / Ques. No.	Performance and Action Points
Error intervals	2F Q23	Many students did not attempt this question. Most answers were wrong. Action Points: <ul style="list-style-type: none"> Ensure students understand how to write inequalities correctly (don't write them the wrong way around).
Zero and negative powers (numerical)	Not assessed	
Standard form	2F Q15	Not many students changed standard form to an ordinary number. Use of the calculator was good, but many final answers were not given in standard form. Action Points <ul style="list-style-type: none"> Reinforce with students that standard form ($a \times 10^n$) <u>must</u> be written with a greater than or equal to 1 and less than 10. When teaching standard form, frequently remind students to, check their final answer is in standard form.

ALGEBRA

New Topic	Paper / Ques. No.	Performance and Action Points
Zero and negative powers (algebraic)	Not assessed	
Fibonacci type sequences	Not assessed	
Quadratic sequences	Not assessed	
Geometric sequences	Not assessed	
Expanding two brackets	1F Q24	Answered very badly. This question could have been answered by expanding brackets or finding individual areas. Perhaps this question proved too abstract for students. Action Points: <ul style="list-style-type: none"> Familiarise students with questions where an equation is to be set-up using a given area (or perimeter) and the dimensions given algebraically. Generally, students need more

New Topic	Paper / Ques. No.	Performance and Action Points
		<p>practice at forming expressions and setting up and solving an equation.</p> <ul style="list-style-type: none"> • Break the stages of working down clearly for students. • Reinforce the need to show all steps of working, especially when the final answer is given.
Factorise quadratics of the form $x^2 + bx + c$	Not assessed	
Solve quadratic equations by factorising	2F Q24	<p>Generally, answered poorly.</p> <p>Action Points:</p> <ul style="list-style-type: none"> • Students need to know they must factorise to solve a quadratic equation and that there are two solutions. • Trial and improvement is not the correct approach. If trial and improvement is used, which leads to one solution, no marks will be awarded.
Solve linear simultaneous equations	3F Q16	<p>Students found this very challenging. Sometimes this was not attempted.</p> <p>Action Points:</p> <ul style="list-style-type: none"> • Students need to check if they can eliminate first without multiplying one or both the equations by looking for matching terms. • Highlight the following misconception when solving a linear equation: $3y = 2$ leads to $y = 1.5$. (Common not just in simultaneous equations.) • If a fraction is converted to a decimal, make sure it is done so correctly (e.g. $1/3 \neq 0.3$).
Identifying turning points (graphically)	Not assessed	
Plot and recognise cubic and reciprocal graphs	3F Q22	<p>Completing the table of values was done well. Many students completed the graph correctly but there were some common mistakes.</p> <p>Action Points:</p> <ul style="list-style-type: none"> • Points for the graph <u>must</u> be joined, and the graph goes through all points. • The graph should be a curve, not joined with straight-line segments.
Roots of equations	Not assessed	

RATIO, PROPORTION AND RATES OF CHANGE

New Topic	Paper / Ques. No.	Performance and Action Points
Density	3F Q20	<p>Many students got a partially correct answer to this question by using the densities to find the total mass but not proceeding any further. The following action point apply to this question and more generally.</p> <p>Action Points:</p> <ul style="list-style-type: none"> Remind students throughout the course to check they have answered the question. Re-read the questions after answering. (In this question, doing this may have made students who had found the total mass realise they had not yet found the density.)
Compound interest	2F Q22	<p>Most students found the interest for one year. More students could compound the interest when the rate remained the same than when it changed during the time period.</p> <p>Action Points:</p> <ul style="list-style-type: none"> Show students that compounding interest correctly does not lead to the same final amount as increasing the investment by the interest rate \times number of years. A greater focus on finding the correct decimal multiplier is needed, for example: the multiplier for a 0.5% increase is not 1.05; the multiplier for a 2.7% increase is not 1.27. Students must know they will not be awarded a mark if they do not write their conclusion when one is required (e.g. "which building society?"). Underlining or circling their chosen answer, or within their working, is not enough.
Reverse percentages	3F Q23	<p>A common mistake was to subtract the percentage increase.</p> <p>Action Points:</p> <ul style="list-style-type: none"> Address this common mistake by letting students learn the following for themselves: If A is increased by $x\%$ to give B, decreasing B by $x\%$ does not lead to A.
Direct and indirect proportion (numeric and algebraic)	Not assessed	
Relate ratios to linear functions	Not assessed	
Gradient of a straight-line graph as rate of change	Not assessed	

New Topic	Paper / Ques. No.	Performance and Action Points
Ratio and Proportion	1F Q10 1F Q17 2F Q10 2F Q18 3F Q5 3F Q10 3F Q18	<i>*There was a far greater emphasis of this topic in the new GCSE. Due to its increased significance, we will consider Ratio and Proportion in a separate analysis.</i>

GEOMETRY AND MEASURES

New Topic	Paper / Ques. No.	Performance and Action Points
Arc lengths	Not assessed	
Areas of sectors	Not assessed	
Fractional scale factors in enlargements	Not assessed	
Trigonometry in 2D	Not assessed	
Vectors	1F Q27	Edexcel's feedback was very limited (2 lines) for this question because so few students knew what to do. Action Points: <ul style="list-style-type: none"> • Ensure this topic is covered fully with students. • Consider sharing good practice (e.g. a professional development session) on how to deliver this topic successfully to foundation tier students. • Introduce the teaching of vectors through a practical approach.
Standard trigonometric values	Not assessed	

PROBABILITY

New Topic	Paper / Ques. No.	Performance and Action Points
Tree diagrams	Not assessed	
Venn diagrams	3F Q15	There were errors made by repeating numbers, missing off numbers, and lots of students did not complete $(A \cup B)'$ or they completed this incorrectly. Action Points: <ul style="list-style-type: none"> • Emphasise to students that each number in the universal set must appear once in the Venn diagram. • Remind students that numbers from the universal set, which do not appear in $A \cup B$, must be included in $(A \cup B)'$.

New Topic	Paper / Ques. No.	Performance and Action Points
		<ul style="list-style-type: none">• Do not repeat the same number twice in the intersection.• To avoid errors, encourage students to list all numbers in the universal set and tick these off as they complete the Venn diagram.• Students need to learn set notation.

Disclaimer

All efforts have been made to accurately represent the feedback provided by Edexcel^{1,2}. Edexcel's examiner's reports included points of consideration for exam centres, some of which have been included above, whilst some of the points made 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 Foundation Papers, Pearson Edexcel GCSE (9-1) Mathematics (1MA1)