



Students in the top two sets will study this additional qualification, parallel to their GCSE Mathematics. Edexcel Extended Mathematics Certificate fills the gap for high achieving students by assessing their higher order mathematical skills, particularly in algebraic reasoning, thus preparing them fully to maximise their potential in further studies. It offers the opportunity for stretch and challenge that builds on the Key Stage 4 curriculum and is intended as an additional qualification to the GCSE Mathematics, rather than as a replacement. Emphasis is placed on higher order technical proficiency, rigorous argument and problem solving skills. It is designed for those who are expected to achieve, grades 7, 8 and 9 in GCSE mathematics and are likely to progress to A-Level study in Mathematics and possibly Further Mathematics.

Year Group: Year 11 Extended Mathematics Certificate

This is the plan for the taught curriculum during achievement period: Sept - Dec

Brief summary of the topic/work being covered during this period

1. Apply addition and subtraction of vectors, multiplication of vectors by a scalar
2. Diagrammatic and column representations of vectors
3. Find the distance between position vectors
4. Use vectors to construct geometric arguments and proofs
1. Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic and quartic functions, the reciprocal function, exponential functions and the trigonometric functions. Key points and intersections will need to be identified including asymptotes. For trigonometric graphs, understand symmetries and periodicity
2. Sketch transformations of a given function including stretches in both directions and combinations of transformations
3. Calculate or estimate gradients of graphs and areas under graphs, interpret results
4. Specific use of the trapezium rule
5. Recognise and use the equation of a circle including those with centre (a,b)
6. Find the equation of a tangent to a circle at a given point

Prior knowledge needed for this unit/topic from previous teaching

1. Vector notation, including column notation.
2. Represent vectors, combinations of vectors and scalar multiples in the plane pictorially.
3. Find the length of a vector using Pythagoras' Theorem.
4. Solve geometric problems in 2D where vectors are divided in a given ratio.
5. Produce geometrical proofs to prove points are collinear and vectors/lines are parallel.
6. Be able to draw linear and quadratic graphs.
7. Calculate the gradient of a linear function between two points, find the equation of a line perpendicular to the radius of a circle
8. Transformations of trigonometric functions.
9. Knowledge of writing statements of direct proportion and forming an equation to find values.
10. Area of a trapezium
11. Formal function notation along with inverse and composite functions
12. The application of circle geometry facts where appropriate: the angle in a semi-circle is 90° ; the perpendicular from the centre to a chord bisects the chord; the angle between tangent and radius is 90° ; tangents from an external point are equal in length.

Rationale for students studying this unit/topic

Rationale for studying this topic

1. Develop knowledge, skills and understanding of higher order mathematical methods and concepts
2. Acquire and use problem solving strategies including the use of algebra as a tool for solving problems
3. Select, apply and link mathematical techniques and methods to solve challenging and non-routine problems
4. Reason mathematically, make deductions and inferences and draw conclusions
5. Interpret and communicate mathematical information in a variety of forms appropriate to the information and context including rigorous use of algebraic argument and formal proof.

Rationale for timing of this topic

1. The drawing and sketching of functions and interpretation of graphs is taught in the current GCSE topic. However this is extended to include exponential functions with up to 3 domains.
2. Recognition of the equation of a circle, centre (0,0), radius r and finding coordinates of points of intersection of a given circle and a given straight line is extended to include circles with centre (a,b)
3. Understand and use the properties of the graphs of $y = \sin x$ and $y = \cos x$ is extended to include $y = \tan x$ for angles of any size.
4. The use of function notation, for example $f(x)$ and the defining of domain and range cements understanding of the function work covered at GCSE and use of the inverse function $f^{-1}(x)$ aids work on changing the subject of a complex algebraic expression

Key concepts/ideas that are taught to students in this unit/topic, including any anticipated gaps in knowledge and plan to overcome these

- Students find it difficult to understand that parallel vectors are equal as they are in different locations in the plane.
- Many may think the graphs of all quadratic functions intercept the x-axis in one or two places and that gradient has the same value for all points for all functions
- The effects of transforming functions is often confused.
- Some students may join the graph of $y = a^x$ ($a > 1$) to the x-axis
- Students may think that the equation of a circle is $(x-a)^2 + (y-b)^2 = r$

New key terminology students will be taught during this topic/unit

The use of function and equation

Linear and non-linear graphs

Quadratic, cubic, reciprocal, exponential

Parabola, Asymptote

Gradient, y-intercept, x-intercept, root

The difference between sketch and plot

Plan for Assessment

- Informal assessment is ongoing through class work, contributions to class discussion and teacher assessment during lessons.
- Teacher's record homework marks for GCSE each week on a centrally held department tracker; the homework tasks are detailed on the schemes of work and outlined centrally within the department to ensure consistency across all classes. Teachers will take in and formally mark a written piece of homework once every two weeks. Students will then have time during a subsequent lesson to review their work and make any corrections
- Formal assessment for Edexcel Extended Mathematics Certificate will take place during this achievement period. The necessary skills are covered in a synoptic paper that aims to assess students' progress in mathematics generally and covers questions from all topics that have been covered at any point in the students' mathematical history (not just this academic year).
- Mini start-of-topic tests will provide information for teachers regarding prior knowledge and existing misconceptions and mini end-of-topic tests will help students and teachers see the progress that has been made over the course of the teaching of the topic.