



Students in the top two sets will study this additional qualification, parallel to their GCSE Mathematics. Edexcel Level 2 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 10 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. Calculate with integer, negative and fractional indices
2. Calculate exactly with surds; simplify surd expressions involving squares and rationalise denominators
3. Identify parallel and perpendicular linear lines in the forms $y = mx + c$, $ax + by + c = 0$ and $(y - y_1) = m(x - x_1)$
4. Make the link between perpendicular lines with the radius and tangent of a circle
5. Solve linear equations in one unknown algebraically and find approximate solutions using a graph
6. Simplify and manipulate algebraic expressions including those involving surds and algebraic fractions
7. Use of Pascal's triangle to expand polynomials where the triangle or relevant row is given
8. Use of the factor theorem
9. Use algebra to support and construct proofs including proof by Deduction, Exhaustion and Counter Example.

Prior knowledge needed for this unit/topic from previous teaching

1. Index laws, including fractional and negative indices
2. Being able to calculate exactly with surds
3. Use the functionality of a scientific calculator when calculating with roots and powers
4. Rearrange an equation into the form $y = mx + c$ and use the form $y = mx + c$ to identify parallel lines
5. Find the equation of a line through one point with a given gradient and the equation of a line through two given points
6. Create a chain of logical steps to formulate a proof in a geometrical situation

Rationale for students studying this unit/topic

Rationale for studying this topic

Students will:

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:

1. Manipulation of surds, including rationalising the denominator builds on the essential skills for GCSE and deepens understanding of using surds as an exact answer
2. Index laws, including fractional and negative indices and the solution of equations allows students to solve equations where the unknown is a power
3. A deep understanding of 2D coordinate geometry will allow the teaching of circle geometry at a later date
4. Factorising complex expressions such as $(2x + 3)^2 - (2x - 5)^2$ extends factorisation needed for GCSE at this time
5. Use of $+$ $-$ \times \div for algebraic fractions with denominators being numeric, linear or quadratic is alongside the GCSE requirement to simplify and manipulate.
6. Use of the factor theorem for rational values of the variable for polynomials will allow students to solve polynomials of a degree greater than 2 at a later date
7. Algebraic proof; builds on their ability to use algebra to construct proofs and arguments with more rigorous proofs required.
8. The ability to construct formal proofs using the correct mathematical notation and vocabulary will not include the proofs of standard theorems, however it will assume knowledge of all angle facts and theorems

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

- For surds, some students may think $\sqrt{a \pm b} = \sqrt{a} \pm \sqrt{b}$
- Some students may think that negative indices change the sign of a number, for example $2^{-1} = -2$ rather than $2^{-1} = \frac{1}{2}$
- In the application of circle theorems, students may think that a cyclic quadrilateral is formed using three points on the circumference along with the centre of the circle
- When constructing a formal proof, students may not appreciate the significance of standard geometrical notation for equal lengths and angles, and think that lengths / angles are equal 'because they look equal'
- Some pupils do not rearrange the equation of a straight line correctly to find the gradient. For example, they think that the line $y - 2x = 6$ has a gradient of -2.
- Some pupils may think that gradient = (change in x) / (change in y) when trying to form the equation of a line through two given points.

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

Conjecture, Derive, Counterexample. Notation for equal lengths and parallel lines and the 'implies that' symbol (\Rightarrow)

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 will not take place for the Extended Maths Certificate during this achievement period.
- 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.