



Year 12 Mathematics – Algebraic Expressions



West Kirby
Grammar School

Learning about this topic is important because:

Computer scientists use indices to describe very large numbers. A quantum computer with 1000 qubits (quantum bits) can consider 2^{1000} values simultaneously. This is greater than the number of particles in the observable universe. It is therefore important to be able to work with numbers presented in different formats.

This builds on: Simplifying expressions, Indices, expanding brackets, factorising and simplifying fractions (GCSE)

This leads to: Y12 Quadratics

We will learn:

- Multiply and divide integer powers
- Expand a single term over brackets and collect like terms
- Expand the product of two or three expressions
- Factorise linear, quadratic and simple cubic expressions
- Know and use the laws of indices
- Simplify and use the rules of surds
- Rationalise denominators

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Indices, base, expanding, factorising, expressions, quadratic, rationalise, surds, denominator, numerator,

You could learn more about this topic by:

Completing all exercises, mixed exercises, challenges and review questions from the textbook, Seeking additional support from your teachers at lunchtime drop in sessions, Searching online for the topic and GeoGebra to find relevant visual and interactive tools for understanding new concepts, using free question banks and revision tools on websites such as MathsGenie and Physics Maths Tutor.



Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The work you produce in class (your file), homework, independent study and regular assessment all form the key pieces of work in this topic.



Year 12 Mathematics – Quadratics

Learning about this topic is important because:

Learning about quadratic equations helps us explore a variety of mathematical concepts; factoring, completing the square, roots of functions, polynomial division, maximum and minimum values etc. These are some basic skills we need when trying to understand other more complex functions. Quadratic functions are used to model projectile motion. Whenever an object is thrown or launched, its path will approximately follow the shape of a parabola.

This builds on: Solving linear and quadratic equations, sketching simple graphs, solving linear inequalities (GCSE) and factorising quadratics (Algebraic Expressions)

This leads to: Graphs and Transformations Y12. A good grasp of quadratic and higher order polynomial functions will give you the substance and foundation to perform differentiation

We will learn:

- Solve quadratic equations using factorisation, the quadratic formula and completing the square
- Read and use $f(x)$ notation when working with functions
- Sketch the graph and find the turning point of a quadratic function
- Find and interpret the discriminant of a quadratic expression
- Use and apply models that involve quadratic functions

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Quadratic, equation, factorising, solve, domain, range, roots, turning point, discriminant, distinct roots, repeated roots

You could learn more about this topic by:

Completing all exercises, mixed exercises, challenges and review questions from the textbook, Seeking additional support from your teachers at lunchtime drop in sessions, Searching online for the topic and GeoGebra to find relevant visual and interactive tools for understanding new concepts, using free





Year 12 Mathematics – Quadratics

	question banks and revision tools on websites such as MathsGenie and Physics Maths Tutor.
--	---

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The work you produce in class (your file), homework, independent study and regular assessment all form the key pieces of work in this topic.



Year 12 Mathematics – Equations and Inequalities

Learning about this topic is important because:

Food scientists use regions on graphs to optimise athletes' nutritional intake and ensure they satisfy the minimum dietary requirements for calories and vitamins.

This builds on: Venn Diagrams, Sets (GCSE), Algebraic expressions: Surds, Quadratics: Sketching Graphs

This leads to: Straight Line Graphs Y12

We will learn:

- Solve linear simultaneous equations using elimination or substitution
- Solve simultaneous equations: one linear and one quadratic
- Interpret algebraic solutions of equations graphically
- Solve linear inequalities
- Solve quadratic inequalities
- Interpret inequalities graphically
- Represent linear and quadratic inequalities graphically

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Linear, simultaneous equations, elimination, substitution, intersection, discriminant, quadratic inequalities, critical value, satisfy, region

You could learn more about this topic by:

Completing all exercises, mixed exercises, challenges and review questions from the textbook, Seeking additional support from your teachers at lunchtime drop in sessions, Searching online for the topic and GeoGebra to find relevant visual and interactive tools for understanding new concepts, using free question banks and revision tools on websites such as MathsGenie and Physics Maths Tutor.





Year 12 Mathematics – Equations and Inequalities

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The work you produce in class (your file), homework, independent study and regular assessment all form the key pieces of work in this topic.	



Year 12 Mathematics – Graphs and Transformations

Learning about this topic is important because:

Many complicated functions can be understood by transforming simpler functions using stretches, reflections, and translations. Particle physicists compare observed results with transformations of known functions to determine the nature of subatomic particles.

This builds on: Factorisation (GCSE), Quadratics: Sketch graphs, Plotting graphs (GCSE), Equations and Inequalities: Solve simultaneous equations

This leads to: Straight Line Graphs Y12, Circles Y12

We will learn:

- Sketch cubic graphs
- Sketch quartic graphs
- Sketch reciprocal graphs of the form $y = \frac{a}{x}$ and $y = \frac{a}{x^2}$
- Use intersection points of graphs to solve equations
- Translate graphs
- Stretch graphs
- Transform graphs of unfamiliar functions

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Root, asymptote, intersection, curves, solutions, translation, vector, stretch, scale factor, reflection, x-axis, y-axis

You could learn more about this topic by:

Completing all exercises, mixed exercises, challenges and review questions from the textbook, Seeking additional support from your teachers at lunchtime drop in sessions, Searching online for the topic and GeoGebra to find relevant visual and interactive tools for understanding





Year 12 Mathematics – Graphs and Transformations

	new concepts, using free question banks and revision tools on websites such as MathsGenie and Physics Maths Tutor.
--	--

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The work you produce in class (your file), homework, independent study and regular assessment all form the key pieces of work in this topic.



Year 12 Mathematics – Straight Line Graphs

Learning about this topic is important because:

Straight line graphs are used in mathematical modelling. Economists use straight line graphs to model how the price and availability of a good affect the supply and demand.

This builds on: Finding points of intersection between straight lines (GCSE), Algebraic Expressions: Simplifying surds, Rearranging formulae (GCSE)

This leads to: Circles and further coordinate geometry

We will learn:

- Calculate the gradient of a line joining a pair of points
- Understand the link between the equation of a line, and its gradient and intercept
- Find the equation of a line given (i) the gradient and one point on the line or (ii) two points on the line
- Find the point of intersection for any pair of straight lines
- Know and use the rules for parallel and perpendicular gradients
- Solve length and area problems on coordinate grids
- Use straight line graphs to construct mathematical models

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Gradient, straight line, y-intercept, integers, parallel, perpendicular, distance, simultaneous equations, direct proportion, origin, model

You could learn more about this topic by:

Completing all exercises, mixed exercises, challenges and review questions from the textbook, Seeking additional support from your teachers at lunchtime drop in sessions, Searching online for the topic and GeoGebra to find relevant visual and interactive tools for understanding new concepts, using free question banks and revision tools on websites such as MathsGenie and Physics Maths Tutor.





Year 12 Mathematics – Straight Line Graphs

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The work you produce in class (your file), homework, independent study and regular assessment all form the key pieces of work in this topic.



Year 12 Mathematics – Circles

Learning about this topic is important because:

Geostationary orbits are circular orbits around the Earth. Meteorologists use geostationary satellites to provide information about the Earth's surface and atmosphere.

This builds on: Quadratics: Complete the square, Straight Line Graphs: Find equations of lines passing through points, Quadratics: Using the discriminant to determine number of solutions

This leads to: Functions and Graphs at Y13

We will learn:

- Find the midpoint of a line segment
- Find the equation of the perpendicular bisector to a line segment
- Know how to find the equation of a circle
- Solve geometrical problems involving straight lines and circles
- Use circle properties to solve problems on coordinate grids
- Find the angle in a semicircle and solve other problems involving circles and triangles

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Midpoint, line segment, perpendicular bisector, circle, radius, point of intersection, chord, tangent, semicircle, diameter, centre

You could learn more about this topic by:

Completing all exercises, mixed exercises, challenges and review questions from the textbook, Seeking additional support from your teachers at lunchtime drop in sessions, Searching online for the topic and GeoGebra to find relevant visual and interactive tools for understanding new concepts, using free question banks and revision tools on websites such as MathsGenie and Physics Maths Tutor.





Year 12 Mathematics – Circles

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The work you produce in class (your file), homework, independent study and regular assessment all form the key pieces of work in this topic.



Year 12 Mathematics – Algebraic Methods

Learning about this topic is important because:

The factor theorem is a useful tool to factorise cubic expressions, Polynomial division will have further use in more advanced algebraic topics as you continue your studies. This is about increasing the tool kit at your disposal so you can tackle more complex algebraic problems.

This builds on: Algebraic Methods: Simplifying fractions, Factorising, GCSE: Long Division, GCSE: Equations of lines passing through coordinates, Quadratics: Complete the Square

This leads to: Algebraic Methods Y13: Partial fractions Y13, Binomial Expansion Y13

We will learn:

- Cancel factors in algebraic fractions
- Divide a polynomial by a linear expression
- Use the factor theorem to factorise a cubic expression

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Algebraic fraction, numerator, denominator, common factor, long division, factor theorem, polynomial

You could learn more about this topic by:

Completing all exercises, mixed exercises, challenges and review questions from the textbook, Seeking additional support from your teachers at lunchtime drop in sessions, Searching online for the topic and GeoGebra to find relevant visual and interactive tools for understanding new concepts, using free question banks and revision tools on websites such as MathsGenie and Physics Maths Tutor.





Year 12 Mathematics – Algebraic Methods



West Kirby
Grammar School

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The work you produce in class (your file), homework, independent study and regular assessment all form the key pieces of work in this topic.



Year 12 Mathematics – Proof

Learning about this topic is important because:

Proof is the cornerstone of mathematics. Mathematicians need to prove theorems (such as Pythagoras' Theorem) before they can use them to solve problems. Pythagoras' theorem can be used to find approximate values for π . You can use proof by contradiction to prove that there is an infinite number of prime numbers. Very large prime numbers are used to encode chip and pin transactions.

This builds on: GCSE: Proof of circle theorems etc, "Show that" questioning styles

This leads to: Various topics such as Trigonometry require well-presented and logical arguments in "Show that" questions in Y12 and 13

We will learn:

- Construct mathematical proofs using algebra
- Use proof by exhaustion and disproof by counter-example
- Use proof by contradiction to prove true statements

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Deduction, logical steps, statement of proof, exhaustion, counter-example, contradiction

You could learn more about this topic by:

Completing all exercises, mixed exercises, challenges and review questions from the textbook, Seeking additional support from your teachers at lunchtime drop in sessions, Searching online for the topic and GeoGebra to find relevant visual and interactive tools for understanding new concepts, using free question banks and revision tools on websites such as MathsGenie and Physics Maths Tutor.





Year 12 Mathematics – Proof

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The work you produce in class (your file), homework, independent study and regular assessment all form the key pieces of work in this topic.



Year 12 Mathematics – The Binomial Expansion



West Kirby
Grammar School

Learning about this topic is important because:

The binomial expansion can be used to expand brackets raised to large powers. It can be used to simplify probability models with large numbers of trials, such as those used by manufacturers to predict faults.

This builds on: Algebraic Methods: Expanding and simplifying expressions, working with indices and fractional powers

This leads to: Binomial Expansion (Year 13) – This is a different type of expansion that is explored, approximations

We will learn:

- Use Pascal's triangle to identify binomial coefficients and use them to expand simple binomial expressions
- Use combinations and factorial notation
- Use the binomial expansion to expand brackets
- Find individual coefficients in a binomial expansion
- Make approximations using the binomial expansions

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Pascals triangle, coefficients, expansion, factorial, term, approximation

You could learn more about this topic by:

Completing all exercises, mixed exercises, challenges and review questions from the textbook, Seeking additional support from your teachers at lunchtime drop in sessions, Searching online for the topic and GeoGebra to find relevant visual and interactive tools for understanding new concepts, using free question banks and revision tools on websites such as MathsGenie and Physics Maths Tutor.





Year 12 Mathematics – The Binomial Expansion



West Kirby
Grammar School

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The work you produce in class (your file), homework, independent study and regular assessment all form the key pieces of work in this topic.



Year 12 Mathematics – Trigonometric Ratios

Learning about this topic is important because:

Trigonometry in both two and three dimensions is used by surveyors to work out distances and areas when planning building projects. You will also use trigonometry when working with vector quantities in mechanics

This builds on: GCSE: Trigonometry, Graphs and Transformations: Sketching graphs

This leads to: Trigonometric Identities and Equations Y12, Radians Y13, General mechanics work in Y12 and 13

We will learn:

- Use the cosine rule to find a missing side or angle
- Use the sine rule to find a missing side or angle
- Find the area of a triangle using an appropriate formula
- Solve problems involving triangles
- Sketch the graphs of the sine, cosine and tangent functions
- Sketch simple transformations of these graphs

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Cosine Rule, Sine Rule, Solutions, Area, Triangle, periodic, maximum value, minimum value, asymptotes

You could learn more about this topic by:

Completing all exercises, mixed exercises, challenges and review questions from the textbook, Seeking additional support from your teachers at lunchtime drop in sessions, Searching online for the topic and GeoGebra to find relevant visual and interactive tools for understanding new concepts, using free question banks and revision tools on websites such as MathsGenie and Physics Maths Tutor.





Year 12 Mathematics – Trigonometric Ratios

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The work you produce in class (your file), homework, independent study and regular assessment all form the key pieces of work in this topic.



Year 12 Mathematics – Trigonometric Identities and Equations

Learning about this topic is important because:

Trigonometric equations can be used to model many real-life situations such as the rise and fall of the tides or the angle of elevation of the sun at different times of the day.

This builds on: Trigonometric Ratios: Sketching trigonometric graphs, finding solutions to trigonometry equations, GCSE: Trigonometry, Quadratics: Solving equations

This leads to: Trigonometric Functions Y13

We will learn:

- Calculate the sine, cosine and tangent of any angle
- Know the exact trigonometric ratios for 30° , 45° and 60°
- Know and use the relationships $\tan \theta \equiv \frac{\sin \theta}{\cos \theta}$ and $\sin^2 \theta + \cos^2 \theta \equiv 1$
- Solve simple trigonometric equations of the forms $\sin \theta = k$, $\cos \theta = k$ and $\tan \theta = k$
- Solve more complicated trigonometric equations of the forms $\sin n\theta = k$ and $\sin(\theta \pm \alpha) = k$ and equivalent equation involving $\cos$ and $\tan$
- Solve trigonometric equations that produce quadratics

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Unit circle, cosine, sine, tangent, quadrants, acute, exact values, identity, principal solution

You could learn more about this topic by:

Completing all exercises, mixed exercises, challenges and review questions from the textbook, Seeking additional support from your teachers at lunchtime drop in sessions, Searching online for the topic and GeoGebra to find relevant visual and interactive tools for understanding new concepts, using free question banks and revision tools on websites such as MathsGenie and Physics Maths Tutor.





Year 12 Mathematics – Trigonometric Identities and Equations

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The work you produce in class (your file), homework, independent study and regular assessment all form the key pieces of work in this topic.	



Year 12 Mathematics – Vectors

Learning about this topic is important because:

Pilots use vector addition to work out the resultant vector for their speed and heading when a plane encounters a strong crosswind. Engineers also use vectors to work out the resultant forces acting on structures in construction.

This builds on: GCSE: Vectors, ratio, Trigonometric Ratios: Finding missing angles in triangles

This leads to: Mechanics Y13, Vectors Y13 (3 dimensions)

We will learn:

- Use vectors in two dimensions
- Use column vectors and carry out arithmetic operations on vectors
- Calculate the magnitude and direction of a vector
- Understand and use position vectors
- Use vectors to solve geometric problems
- Understand vector magnitude and use vectors in speed and distance calculations
- Use vectors to solve problems in context

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Line segments, parallel, direction, magnitude, triangle law, vector addition, zero vector, scalar, component, unit vector, two-dimensional

You could learn more about this topic by:

Completing all exercises, mixed exercises, challenges and review questions from the textbook, Seeking additional support from your teachers at lunchtime drop in sessions, Searching online for the topic and GeoGebra to find relevant visual and interactive tools for understanding new concepts, using free question banks and revision tools on websites such as MathsGenie and Physics Maths Tutor.





Year 12 Mathematics – Vectors



West Kirby
Grammar School

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The work you produce in class (your file), homework, independent study and regular assessment all form the key pieces of work in this topic.



Year 12 Mathematics – Differentiation

Learning about this topic is important because:

Differentiation and integration can help us solve many types of real-world problems. We use the derivative to determine the maximum and minimum values of particular functions (e.g. cost, strength, amount of material used in a building, profit, loss, etc.). Derivatives are met in many engineering and science problems, especially when modelling the behaviour of moving objects. You will use differentiation in mechanics to model rates of change, such as speed and acceleration.

This builds on: Straight Line Graphs: Finding gradients, Algebraic Methods: Working with indices and surds, Straight Line Graphs

This leads to: Differentiation (Year 13), Integration Y12 and 13, Variable Acceleration Y12

We will learn:

- Find the derivative, $f'(x)$ or $\frac{dy}{dx}$, of a simple function
- Use the derivative to solve problems involving gradients, tangents and normal
- Identify increasing and decreasing functions
- Find the second order derivative, $f''(x)$ or $\frac{d^2y}{dx^2}$ of a simple function
- Find stationary points of functions and determine their nature
- Sketch the gradient function of a given function
- Model real-life situations with differentiation

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Gradient, curve, point, tangent, function, derivative, limit, quadratic, increasing function, decreasing function, differentiation, second order derivative, stationary point, local maximum, local minimum, point of inflection

You could learn more about this topic by:

Completing all exercises, mixed exercises, challenges and review questions from the textbook, Seeking additional support from your teachers at lunchtime drop in sessions, Searching online for the topic and GeoGebra to find relevant visual and interactive tools for understanding new concepts, using free question banks and revision tools on websites such as MathsGenie and Physics Maths Tutor.





Year 12 Mathematics – Differentiation



West Kirby
Grammar School

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The work you produce in class (your file), homework, independent study and regular assessment all form the key pieces of work in this topic.



Year 12 Mathematics – Integration

Learning about this topic is important because:

Integration is the opposite of differentiation. It is used to calculate areas of surfaces, volumes of irregular shapes and areas under curves. In mechanics, integration can be used to calculate the area under a velocity-time graph to find distance travelled.

This builds on: Algebraic Expressions: Simplifying indices and surds, Differentiation: differentiating simple polynomials, Graphs and Transformations: Sketching curves

This leads to: More complex integration Y13

We will learn:

- Find y given $\frac{dy}{dx}$ for x^n
- Integrate polynomials
- Find $f(x)$, given $f'(x)$ and a point on the curve
- Evaluate a definite integral
- Find the area bounded by a curve and the x -axis
- Find areas bounded by curves and straight lines

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Functions, integrating, polynomials, constant of integration, derivative, interval, definite integration, area, positive curve, trapeziums, limits

You could learn more about this topic by:

Completing all exercises, mixed exercises, challenges and review questions from the textbook, Seeking additional support from your teachers at lunchtime drop in sessions, Searching online for the topic and GeoGebra to find relevant visual and interactive tools for understanding





Year 12 Mathematics – Integration

	new concepts, using free question banks and revision tools on websites such as MathsGenie and Physics Maths Tutor.
--	--

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The work you produce in class (your file), homework, independent study and regular assessment all form the key pieces of work in this topic.



Year 12 Mathematics – Exponentials and Logarithms

Learning about this topic is important because:

Logarithms are used to report and compare earthquakes. Both the Richter scales and the newer moment magnitude scale use base 10 logarithms to express the size of seismic activity.

This builds on: GCSE: Working with powers, Algebraic Expressions: Simplifying indices, GCSE: Regression: Plotting a line of best fit and determining its gradient and intercepts.

This leads to: Regression, Correlation and Hypothesis Testing Y13, Various other topics Y13

We will learn:

- Sketch graphs of the form $y = a^x$, $y = e^x$, and transformations of these
- Differentiate e^{kx} and understand why this result is important
- Use and interpret models that use exponential functions
- Recognise the relationship between exponents and logarithms
- Recall and apply the laws of logarithms
- Solve equations of the form $a^x = b$
- Describe and use the natural logarithm function
- Use logarithms to estimate the values of constants in non-linear models

We will develop/practise skills including:

- Use and apply standard techniques: Select and correctly carry out routine procedures; and accurately recalling facts, terminology and definitions.
- Reason, interpret and communicate mathematically: Construct rigorous mathematical arguments, make deductions and inferences, assess the validity of mathematical arguments, explaining your reasoning; and using mathematical language and notation correctly.
- Solve problems within mathematics and in other contexts: Translate problems in mathematical and non-mathematical contexts into mathematical processes, use mathematical models and interpret solutions to problems in their original context, and, where appropriate, evaluating their accuracy and limitations and explain how to refine them.

Some of the vocabulary that we will use includes:

Exponential, differential, logarithms, power, indices, inverse functions,

You could learn more about this topic by:

Completing all exercises, mixed exercises, challenges and review questions from the textbook, Seeking additional support from your teachers at lunchtime drop in sessions, Searching online for the topic and GeoGebra to find relevant visual and interactive tools for understanding new concepts, using free question banks and revision tools on websites such as MathsGenie and Physics Maths Tutor.





Year 12 Mathematics – Exponentials and Logarithms

Your teacher will assess your knowledge & understanding throughout the topic by looking at your work, questioning, discussion and giving you feedback in lots of different ways. The work you produce in class (your file), homework, independent study and regular assessment all form the key pieces of work in this topic.