Year 12 Pure Maths Curriculum Summary

Y12 Pure Mathematics

When?	Topic	Knowledge	Unit Assessment
HALF TERM 1	**Algebraic expressions**	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	• Expand brackets (single, double, triple) • Collect like terms • Factorise linear, quadratic and simple cubic expressions • Laws of indices • Rules of surds • rationalise
	Quadratics	● 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	• solve quadratics • factorise • complete the square • quadratic formula • curve sketching • turning point • discriminant • modelling quadratics

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	Equations and inequalities	● 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	• simultaneous equations, linear and quadratics • inequalities, linear and quadratics
HALF TERM 2	**Graphs and transformations**	● Sketch cubic graphs ● Sketch quartic graphs ● Sketch reciprocal graphs of the form $y = x^a$ and $y = ax^2$ ● Use intersection points of graphs to solve equations ● Translate graphs ● Stretch graphs ● Transform graphs of unfamiliar functions	• sketch cubic, quartic, reciprocal • solve equations • translate, stretch, transform graphs
	Straight line graphs	● 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 a 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	• gradient • $y = mx + c$ • points of intersection • parallel and perpendicular gradients • length and area problems • modelling

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	Circles	● 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 geometric 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	• midpoint • perpendicular bisector • equation of a circle • straight lines and circles • circle properties • angle in a semicircle
HALF TERM 3	**Algebraic methods**	● Cancel factors in algebraic fractions ● Divide a polynomial by a linear expression ● Use the factor theorem to factorise a cubic expression ● Construct mathematical proofs using algebra ● Use proof by exhaustion and disproof by counter-example	• algebraic fractions • algebraic long division • algebraic proof • proof by exhaustion and disproof by counter-example
	The binomial expansion	● 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 expansion	• Pascal's triangle • combinations and factorial notation • binomial expansion • approximations using the binomial expansion
	Trigonometric ratios	● 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	• cosine rule • sine rule • area of a triangle • graphs of the sine, cosine and tangent functions • Sketch simple transformations of these graphs

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HALF TERM 4	**Trigonometric identities and equations**	● Calculate the sine, cosine and tangent of any angle ● Know the exact trigonometric ratios for 30°, 45° and 60° ● Know and use the relationships $\tan\theta = \sin\theta/\cos\theta$ and $\sin^2\theta + \cos^2\theta = 1$ ● 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 $\sin(\theta +- \alpha) = k$ and equivalent equations involving cos and tan ● Solve trigonometric equations that produce quadratics	● **Sin, cos, tan** ● exact trigonometric ratios for 30°, 45° and 60° ● relationships $\tan\theta = \sin\theta/\cos\theta$ and $\sin^2\theta + \cos^2\theta = 1$ ● Solve simple trigonometric equations ● $\sin(\theta +- \alpha) = k$
	Vectors	● 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	● 2D vectors ● Column vectors ● Magnitude and direction ● Position vectors ● Vector problems ● vectors in speedand distance calculations ●
	Differentiation	● Find the derivative, f'(x) or dy/dx, of a simple function ● Use the derivative to solve problems involving gradients, tangents and normals ● Identify increasing and decreasing functions ● Find the second order derivative, f ''(x) or d^2y/dx^2, of asimple function ● Find stationary points of functions and determine their nature ● Sketch the gradient function of a given function ● Model real-life situations with differentiation	● f'(x) or dy/dx ● gradients, tangents and normal ● increasing and decreasing functions ● f ''(x) or d^2y/dx^2 ● stationary points ● gradient function ● modelling

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HALF TERM 5	**Integration**	● Find y given 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	• integrate term by term • definite integrals • bounded area
e^x	**Exponentials and logarithms**	● Sketch graphs of the form $y = a^x$, $y = e^x$, and transformations of these graphs ● 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	• sketch and transform $y = a^x$, $y = e^x$ • Differentiate e^{kx} • laws of logarithms • solve equations using logs • natural logs • modelling