

Year 12 Further Maths - Pure Teacher

Topic		Ref	Ex
Matrices and Transformations	Introduction to Matrices <ul style="list-style-type: none"> • Add, subtract and multiply conformable matrices. • Multiply a matrix by a scalar. • Understand and use zero and identity matrices. 	P3.1 P3.2	
	Matrices and Transformations <ul style="list-style-type: none"> • Find the 2x2 matrix associated with a linear transformation and vice versa. <ul style="list-style-type: none"> ○ Reflection in coordinate axes and lines $y = \pm x$ ○ Rotation through any angle about (0, 0) ○ Stretches parallel to the x-axis and y-axis ○ Enlargement about centre (0, 0), with scale factor k, ($k \neq 0$). • Successive transformations – A followed by B is represented by the matrix BA. • Find 3x3 matrices representing 3D transformations <ul style="list-style-type: none"> ○ Reflection in plane $x=0$, $y=0$ or $z=0$ ○ Rotations through multiples of 90° about the x, y or z axes. 	P3.3	
	Invariant Points <ul style="list-style-type: none"> • Find co-ordinates of invariant points for a given transformation • Find equations of invariant lines for a given transformation 	P3.4	
Matrices and Transformations Assessment			
Complex Numbers	Introduction to Complex Numbers <ul style="list-style-type: none"> • Understand the definition of a complex number • Understand and use the terms real part and imaginary part. • Add, subtract, multiply and divide complex numbers in the form $x+iy$ with x and y real • Find the complex conjugate • Solve any quadratic equation with real coefficients. • Know that the non-real roots of quadratic equations (with real coefficients) form a conjugate pair • Find the square root of a complex number 	P2.1 P2.2 P2.3	
	The Argand Diagram <ul style="list-style-type: none"> • Use and interpret Argand diagrams. • Represent the sum or difference of two complex numbers on an Argand diagram. 	P2.4	
Complex Numbers Assessment			

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Topic		Ref	Ex
Matrices and their Inverses	2x2 Matrices <ul style="list-style-type: none"> • Calculate the determinant of a 2x2 matrix • Use the property $\det AB = \det A \times \det B$ • Know that the magnitude of the determinant of a 2x2 matrix gives the area scale factor of the associated transformation, and that the sign of the determinant indicates whether the orientation of the image is preserved or reversed. • Understand what is meant by a singular matrix and a non-singular matrix • Calculate the inverse of a 2x2 matrix • Prove and use the property $(AB)^{-1} = B^{-1} A^{-1}$ 	P3.5 P3.6	
	3x3 Matrices <ul style="list-style-type: none"> • Calculate the determinant of a 3x3 matrix either manually or using the matrix facility on a calculator. • Know that the magnitude of the determinant of a 3x3 matrix gives the volume scale factor of the associated transformation, and that the sign of the determinant indicates whether the orientation of the image is preserved or reversed. • Calculate the inverse of a 3x3 matrix either manually or using the matrix facility on a calculator. 	P3.5 P3.6 P3.7	
	Matrices and Simultaneous Equations <ul style="list-style-type: none"> • Solve three linear simultaneous equations in three variables by use of the inverse matrix • Interpret geometrically the solution and failure of solution of three simultaneous linear equations. <ul style="list-style-type: none"> ○ meet in a point ○ form a sheaf ○ form a prism or are otherwise inconsistent 	P3.7 P3.8	
Matrices and their Inverses Assessment			
Roots of polynomials	Roots and coefficients <ul style="list-style-type: none"> • Know about the relationships between roots and coefficients of quadratic, cubic and quartic equations. • Be able to form a new equation whose roots are related to the roots of a given equation by a linear transformation. 	P4.1 P4.2	
	Complex Roots of Polynomials <ul style="list-style-type: none"> • Understand that non-real roots of polynomial equations with real coefficients occur in conjugate pairs. • Be able to solve cubic or quartic equations with real coefficients. 	P2.1	
Roots of Polynomials Assessment			

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Complex Numbers and Geometry	Modulus and Argument <ul style="list-style-type: none"> • Find the modulus and argument of a complex number • Convert between the Cartesian form and the modulus-argument form of a complex number. • Multiply and divide complex numbers in modulus-argument form 	P2.5 P2.6	
	Loci in the complex plane <ul style="list-style-type: none"> • To construct and interpret simple loci in the Argand diagram. <ul style="list-style-type: none"> ○ $z - a = r$ ○ $\text{Arg}(z - a) = \beta$ ○ $z - a = z - b$ • Understand and use Radians as an alternative angle measure. 	P2.7	
Complex Numbers and Geometry Assessment			
Sequences, Series and Proof	Summing Series <ul style="list-style-type: none"> • Understand and use formulae for the sums of integers, squares and cubes and use these to sum other series. 	P4.3	
	Proof by Induction <ul style="list-style-type: none"> • Construct proofs using mathematical induction. • Contexts include sums of series, divisibility and powers of matrices. 	P1.1	
Sequences and Series Assessment			
Vectors and 3-D Space	The Scalar Product <ul style="list-style-type: none"> • Calculate the scalar product of two vectors • Use the scalar product to find the angle between two vectors • Check whether two vectors are perpendicular using the scalar product. 	P6.3 P6.4	
	The Equation of a Line <ul style="list-style-type: none"> • Express the equation of a line in three dimensions in vector form and in Cartesian form • Calculate the angle between two lines using the scalar product • Find the point of intersection of two straight lines given in vector form • Understand that two lines in three dimensions may either intersect, be parallel or be skew 	P6.1	
	The Equation of a Plane <ul style="list-style-type: none"> • Form and use vector and Cartesian equations of a plane • Convert between the different forms for the equation of a plane • Understand that a vector which is perpendicular to a plane is perpendicular to any vector in the plane • Find the angle between two planes by finding the angle between their normals • Find the angle between a line and a plane • Find the point of intersection of a line and a plane 	P6.2 P6.3 P6.5	

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Topic		Ref	Ex
Vectors and 3-D Space (cont.)	Finding Distances <ul style="list-style-type: none"> • Find the perpendicular distance from a point to a plane • Find the perpendicular distance from a point to a line • Find the perpendicular distance between two lines 	P6.5	
Vectors and 3-D Space Assessment			
Further Calculus	Volumes of Revolution <ul style="list-style-type: none"> • Calculate the volume of a solid of revolution formed by rotating a plane region about the x-axis or y-axis. • Derive the formulae for calculating the volume of revolution. 	P5.1	
Further Calculus Assessment			