Year 12 Further Maths – Core Pure Teacher

Topic		Ref	Ex
Matrices and Transformations	**Introduction to Matrices** • Add, subtract and multiply conformable matrices. • Multiply a matrix by a scalar. • Understand and use zero and identity matrices.	P3.1 P3.2	6A 6B

	Matrices and Transformations
	• Find the 2x2 matrix associated with a linear transformation and vice versa.
	  ○ 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
	  ○ Reflection in plane x=0, y=0 or z=0
	  ○ Rotations through multiples of 90° about the x, y or z axes.
	• Use inverse matrices to reverse linear transformations
		P3.3	7A
			7B
			7C
			7D
			7E
			7F
			7G

	Invariant Points • Find co-ordinates of invariant points for a given transformation • Find equations of invariant lines for a given transformation	P3.4	7B 7C
Matrices and Transformations Assessment			
Complex Numbers	**Introduction to Complex Numbers** • 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	1A 1B 1C 1D 1E 1F
	The Argand Diagram • Use and interpret Argand diagrams. • Represent the sum or difference of two complex numbers on an Argand diagram.	P2.4	2A 2B
Complex Numbers Assessment			

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Topic		Ref	Ex
Matrices and their Inverses	**2x2 Matrices** • Calculate the determinant of a 2x2 matrix • Use the property det AB = det A x 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	6C 6D
	3x3 Matrices • 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	6E

	Matrices and Simultaneous Equations
	• 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.
	  ○ meet in a point
	  ○ form a sheaf
	  ○ form a prism or are otherwise inconsistent
		P3.7
		P3.8
			6F

Matrices and their Inverses Assessment			
Roots of polynomials	**Roots and coefficients** • 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	4A 4B 4C 4D 4E
	Complex Roots of Polynomials • 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	1E 1F
Roots of Polynomials Assessment			

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Topic		Ref	Ex
Complex Numbers and Geometry	**Modulus and Argument** • 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	2B 2C 2D
	Loci in the complex plane • To construct and interpret simple loci in the Argand diagram. ○ $\lvert z - a \rvert = r$ ○ $\text{Arg}(z - a) = \beta$ ○ $\lvert z - a \rvert = \lvert z - b \rvert$ • Understand and use Radians as an alternative angle measure.	P2.7	2E 2F
Complex Numbers and Geometry Assessment			
Sequences, Series and Proof	**Summing Series** • Understand and use formulae for the sums of integers, squares and cubes and use these to sum other series.	P4.3	3A 3B
	Proof by Induction • Construct proofs using mathematical induction. • Contexts include sums of series, divisibility and powers of matrices.	P1.1	8A 8B 8C
Sequences and Series Assessment			
Vectors and 3-D Space	**The Scalar Product** • 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	9C 9D
	The Equation of a Line • 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	9A 9D 9E
	The Equation of a Plane • 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	9B 9D

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Topic		Ref	Ex
Vectors and 3-D Space (cont.)	**Finding Distances** • 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	9F
Vectors and 3-D Space Assessment			
Further Calculus	**Volumes of Revolution** • 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	5A 5B 5C 5D
Further Calculus Assessment			