Year 12EXT2 **Topic 1: COMPLEX NUMBERS** **Time: 1 Week**
Part E - Geometrical implications of complex numbers

Syllabus Content: Using Complex Numbers N2
Content: Geometrical implications of complex numbers N2.2

Student Outcomes: MEX – 12.1, 4, 7 and 8
A student:

› understands and uses different representations of numbers and functions to model, prove results and find solutions to problems in a variety of contexts MEX12-1
› uses the relationship between algebraic and geometric representations of complex numbers and complex number techniques to model and solve problems MEX12-4
› applies various mathematical techniques and concepts to prove results, model and solve structured, unstructured and multi-step problems MEX12-7
› communicates and justifies abstract ideas and relationships using appropriate language, notation and logical argument MEX12-8

	Student is able to:	Implications, considerations and implementations	Resources
(i)	examine and use addition and subtraction of complex numbers as vectors in the complex plane: – given the points representing z_1 and z_2, find the position of the points representing $z_1 + z_2$ and $z_1 - z_2$ – describe the vector representing $z_1 + z_2$ or $z_1 - z_2$ as corresponding to the relevant diagonal of a parallelogram with vectors representing z_1 and z_2 as adjacent sides	1A The arithmetic of complex numbers 1B Quadratic equations 1C The Argand diagram 1D Modulus-argument form **1E Vectors and the complex plane** **1F Curves and regions in the Argand diagram** 1G Polynomials and complex numbers	
(ii)	examine and use the geometric interpretation of multiplying complex numbers, including rotation and dilation in the complex plane		
(iii)	recognise and use the geometrical relationship between the point representing a complex number $z = a + ib$, and the points representing $\bar{z}$, cz (where c is real) and iz		

(iv)	determine and examine the *n*th roots of unity and their location on the unit circle		
(v)	determine and examine the *n*th roots of complex numbers and their location in the complex plane		
(vi)	solve problems using *n*th roots of complex numbers		
(vii)	identify subsets of the complex plane determined by relations	Eg. $\|z - 3i\| \leq 4$, $\frac{\pi}{4} \leq Arg(z) \leq \frac{3\pi}{4}$, $Re(z) > Im(z)$ and $\|z - 1\| = 2\|z - i\|$	