# CB - Complex Numbers

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| **Give 3 different forms of a complex number** |  |
| **Prove |z1z2| = |z1||z2| and arg(z1z2) = arg(z1) + arg(z2)** | *Note, it follows that…* |
| **What does De Moivre’s Theorem state?** | If z = r(cosθ + isinθ) then zn = rn(cos(nθ) + isin(nθ)) for all n ∈ R |
| **How can you express sin(nθ) and cos(nθ) in powers of sinθ and cosθ?** | 1. Rewrite sin(nθ) and cos(nθ) as [sin(θ) and cos(θ)]n using De Moivre’s Theorem. 2. Expand the brackets. 3. Equate real and imaginary parts. 4. Use any identities, if necessary. |
| **How can sin(nθ) and cos(nθ) be expressed in terms of z = cos(θ) + isin(θ) and e’s?** | Thus…    *This can be shown using De Moivre’s and the fact that cosine is odd and sine is even.* |
| **How can you express sinnθ and cosnθ in terms of sin(nθ) or cos(nθ)?** | 1. Use the fact that 2cosθ = z + z-1 or 2isinθ = z - z-1 2. Raise both sides the required power 3. Use the fact that 2cos(nθ) = zn + z-n or 2isin(nθ) = zn - z-n |
| **What 2 results arise from the roots of unity?** | 1. The sum of all roots to zero (by symmetry of vectors) 2. If z2 = ωthen multiplying it by itself gives ω2 = z3    * Since it rotates the complex number (keeping magnitude the same) as arg(zn) = narg(z) |
| **How do you find the nth root of a complex number?** | 1. Set zn = (complex number) 2. Add 2kπ (or 2kπi if Euler’s Formula is used) to the complex number 3. nth root both sides 4. Find the value for z for different values of k |
| **How a circle loci written using complex numbers?** |  |
| **How is a perpendicular bisector loci written using complex numbers?** |  |
| **How is the half-line loci written using complex numbers?** |  |
| **How does z and z\* relate on an Argand Diagram and in mod-arg form?** | * z and z\* are mirror images in the real axis. |