Complex Numbers
Checklist

Use this alongside our Walkthrough Guides to tick off the concepts you're confident with to plan your study and find areas of improvement!

Surds

- ◯ I can explain what a **surd** is
- ◯ I can explain the difference between a **rational** and an **irrational number**
- ◯ I can explain why every square root has two values
- ◯ I can simplify surds
- ◯ I can explain what a **conjugate** is
- ◯ I can explain what a compound surd is
- ◯ I can explain why there's only one conjugate
- ◯ I can add and subtract surds
- ◯ I can identify like terms
- ◯ I can multiply compound surds using FOIL
- ◯ I can divide compound surds when the numerator is greater than 1

Real and Complex Numbers

- ◯ I can explain **factors**
- ◯ I can explain **remainders**
- ◯ I can use the **remainder theorem** to find factors of polynomials
- ◯ I can explain the link between factors and roots of a function
- ◯ I can identify a quadratic equation
- ◯ I can find solutions by using the quadratic formula
- ◯ I can find the equation from the roots
- ◯ I can find solutions by completing the square
- ◯ I can find the nature of roots using the discriminant
- ◯ I can find a range of numbers for where an equation has one, both, or no roots.
- ◯ I can explain where the imaginary number comes from

Rectangular Form

- ◯ I can add and subtract complex numbers in rectangular form
- ◯ I can multiply complex numbers in rectangular form
- ◯ I can divide complex numbers using conjugates
- ◯ I can equate real and imaginary numbers to solve an equation
- ◯ I can find the complex roots of polynomials using the quadratic formula, completing the square method, or remainder theorem

Special Triangles

- ◯ I can explain the difference between degrees and radians
- ◯ I can convert degrees to radians and vice versa
- ◯ I can explain why using radians has advantages over using degrees
- ◯ I can remember the six trigonometric ratios based on an equilateral triangle
- ◯ I can remember the three trigonometric ratios based on a right-angle triangle

Polar Form

- ◯ I understand that complex numbers can be written in polar form, where $z = r \times \text{cis}\theta$
- ◯ I understand that $\text{cis}\theta$ is short for $\cos\theta + i.\sin\theta$
- ◯ I can state the symbols for the **modulus** and **argument**
- ◯ I can identify **r** on an Argand diagram, and determine its value
- ◯ I can identify **θ** on an Argand diagram, and determine its value
- ◯ I can express θ from an Argand diagram as an angle between -180° and +180°
- ◯ I can express a complex number in polar form using the values for r and θ
- ◯ I can multiply complex numbers in polar form by multiplying the r values and adding the θ values
- ◯ I can divide complex numbers in polar form by dividing the r values and subtracting the θ values
- ◯ I can use De Moivre's Theorem to calculate the power of a complex number in polar form
- ◯ I can use De Moivre's Theorem to find the n root of a complex number in polar form
- ◯ I can use trigonometry to convert a complex number into rectangular form to polar form
- ◯ I can use trigonometry to convert a complex number into polar form to rectangular form
- ◯ I can convert a complex number into polar form to rectangular form by expanding $r \times \text{cis}\theta$ into $r.\cos\theta+(r.\sin\theta)$

Loci

- ◯ I can define a **locus**
- ◯ I can use the rectangular form to split z into real and imaginary parts
- ◯ I understand that $|x + iy|$ represents the modulus of the locus
- ◯ I can express the modulus of the locus $|x + iy|$ as: $\sqrt{(x^2 + y^2)}$
- ◯ I can determine the equation of a locus, where the value of the modulus is given
- ◯ I can calculate the gradient and y-intercept of a straight line in the form: $y = mx + c$
- ◯ I can calculate the position of the centre of a circle and its radius from its equation in the form $(x - a)^2 + (y - b)^2 = r^2$
- ◯ I can determine what kind of conic section (straight line, circle, ellipse, hyperbola or parabola) is represented by the equation of a locus
- ◯ I can draw the equation of a locus, where the locus represents a straight line or a circle

