

Core Pure 1

Complex Numbers

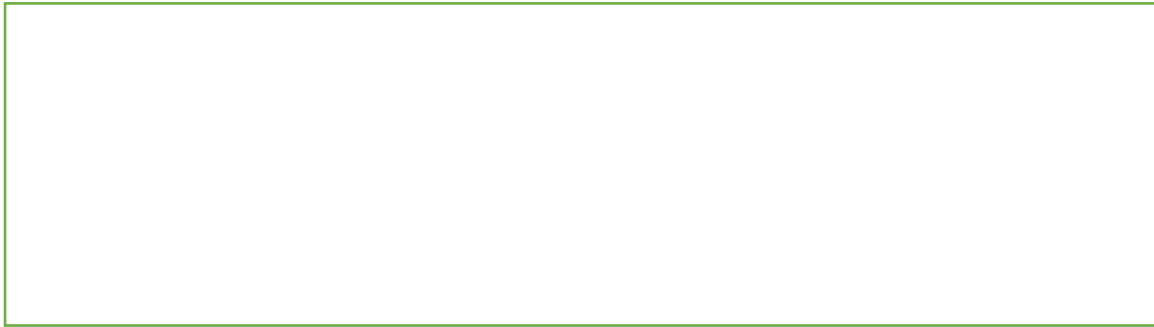
Chapter Overview

- 1: Understand and manipulate (\times , \div) complex numbers.
- 2: Find complex solutions to quadratic equations.
- 3: Find complex solutions to cubic and quartic equations.

2 Complex numbers	2.1	<p>Solve any quadratic equation with real coefficients.</p> <p>Solve cubic or quartic equations with real coefficients.</p>	<p>Given sufficient information to deduce at least one root for cubics or at least one complex root or quadratic factor for quartics, for example:</p> <p>(i) $f(z) = 2z^3 - 5z^2 + 7z + 10$</p> <p>Given that $2z - 3$ is a factor of $f(z)$, use algebra to solve $f(z) = 0$ completely.</p> <p>(ii) $g(x) = x^4 - x^3 + 6x^2 + 14x - 20$</p> <p>Given $g(1) = 0$ and $g(-2) = 0$, use algebra to solve $g(x) = 0$ completely.</p>
	2.2	<p>Add, subtract, multiply and divide complex numbers in the form $x + iy$ with x and y real.</p> <p>Understand and use the terms 'real part' and 'imaginary part'.</p>	<p>Students should know the meaning of the terms, 'modulus' and 'argument'.</p>

2 Complex numbers <i>continued</i>	2.3	<p>Understand and use the complex conjugate.</p> <p>Know that non-real roots of polynomial equations with real coefficients occur in conjugate pairs.</p>	<p>Knowledge that if z_1 is a root of $f(z) = 0$ then z_1^* is also a root.</p>
	2.4	<p>Use and interpret Argand diagrams.</p>	<p>Students should be able to represent the sum or difference of two complex numbers on an Argand diagram.</p>
	2.5	<p>Convert between the Cartesian form and the modulus-argument form of a complex number.</p>	<p>Knowledge of radians is assumed.</p>
	2.6	<p>Multiply and divide complex numbers in modulus argument form.</p>	<p>Knowledge of the results</p> $ z_1 z_2 = z_1 z_2 , \quad \left \frac{z_1}{z_2} \right = \frac{ z_1 }{ z_2 }$ $\arg(z_1 z_2) = \arg z_1 + \arg z_2$ $\arg\left(\frac{z_1}{z_2}\right) = \arg z_1 - \arg z_2$ <p>Knowledge of radians and compound angle formulae is assumed.</p>

Complex Number Basics



Examples: Write the following in terms of i

$$\sqrt{-36} =$$

$$\sqrt{-1} =$$

$$\sqrt{-4} =$$

$$\sqrt{-7} =$$

Simplify:

$$(2 + 3i) + (4 + i) =$$

$$i - 3(2 - i) =$$

$$\frac{10+4i}{2} =$$

Solving Quadratic Equations

Examples

1. Solve $z^2 + 25 = 0$

2. Solve $z^2 + 3z + 5 = 0$