

Core Content

Cluster Title: Use complex numbers in polynomial identities and equations.
Standard N.CN.8 (+): Extend polynomial identities to the complex numbers. (For example, rewrite $x^2 + 4$ as $(x + 2i)(x - 2i)$.)
Concepts and Skills to Master
<ul style="list-style-type: none"> Express a quadratic as a product of two complex factors.

Supports for Teachers

Critical Background Knowledge	
<ul style="list-style-type: none"> Factor quadratics. Understand that some quadratic functions have complex solutions. Know the definition of i. Perform operations on complex numbers. Standard form of a complex number. 	
Academic Vocabulary	
conjugates, complex numbers, i , factor	
Suggested Instructional Strategies	Resources
<ul style="list-style-type: none"> Demonstrate that any binomial quadratic expression can be expressed as the difference of two squares (e.g., $x^2 + 16 = x^2 - 16i^2$). 	
Sample Formative Assessment Tasks	
Skill-Based Task: Factor over the complex number system. $x^2 + 16$ Answer: $(x + 4i)(x - 4i)$ $x^2 - 10x + 34$ Answer: $(x + 5i)(x - 5i)$	Problem Task: Expand the expression $(x + 3)(x - 5i)(x + 5i)$ two ways: A. $[(x + 3)(x - 5i)](x + 5i)$ B. $(x + 3)[(x - 5i)(x + 5i)]$ Compare and contrast the methods.

Core Content

Cluster Title: Use complex numbers in polynomial identities and equations.
Standard N.CN.9 (+): Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.
Concepts and Skills to Master
<ul style="list-style-type: none"> Know that the Fundamental Theorem of Algebra guarantees that any quadratic function will have a solution in the complex number system.

Supports for Teachers

Critical Background Knowledge	
<ul style="list-style-type: none"> Solve quadratic equations. Know the definition of a complex number (Sec II:N.CN.1). Understand the mathematical definition of closure. 	
Academic Vocabulary	
Fundamental Theorem of Algebra, solutions, complex, roots, real number system, complex number system, algebraically closed, multiplicity	
Suggested Instructional Strategies	Resources
<ul style="list-style-type: none"> Relate the types of solutions to the different number system. Connect to the need of different number systems. 	
Sample Formative Assessment Tasks	
<p>Skill-Based Task: In the system of integer numbers, explain why there is no answer to the equation: $3x = 5$. In the system of rational numbers, explain why there is no answer to the equation: $x^2 + 5 = 0$.</p>	<p>Problem Task: Why is it better to solve quadratic equations in the complex number system rather than in the real number system?</p>