Complex Numbers

What happens when we want to solve the equation: $x^2 = -4$?

In order to solve this equation, we must introduce $\sqrt{-1}$ and the set of *imaginary* numbers.

We will represent $\sqrt{-1}$ with ***i***.

This leads to $\left(\sqrt{-1}\right)^2 = i^2$

$\left(\sqrt{-1}\right)^2 = -1 = i^2$

Therefore, $-1 = i^2$

Any square root of a negative number can be written in terms of ***i.***

$\sqrt{-2} =$ $\sqrt{-4} =$

$\sqrt{-9} =$ $\sqrt{-12} =$

A ***complex*** number has a real part and an imaginary part.

$3 + 5i$

We can add, subtract, multiply, and divide complex numbers.

Perform the indicated operations:

1. $(-4 + 7i) + (3 + 2i)$

2. $(3 - 5i) - (7 + 4i)$

3. $(2 + 3i)(4 + 5i)$

4. $(4 - i)^2$

Replace i^2 with -1

Rationalize the denominators. (Divide)

Review: $\frac{3}{5\sqrt{2}}$

5. $\frac{3-5i}{2i}$

Review: $\frac{3}{4+\sqrt{5}}$

The "***complex conjugate***" of $3+5i$ is $3-5i$

Multiply: $(3+5i)(3-5i)$

6. $\frac{2i}{3-5i}$

7. $\frac{3+2i}{-5+4i}$