College Prep Math
Complex Numbers Notes

Today I will…	I'll know I've got it when…	Essential Question…

<u>Complex Numbers:</u> A combination of real number and imaginary number in the form, *a+bi*, where *a* is the real part and *bi* is the imaginary part. These help us solve quadratic equations with no real solutions.

<u>Imaginary numbers:</u>
1. To allow for "hidden roots"
2. The concept of $\sqrt{-1}$ was proposed and is now accepted as an extension of the real number system
3. Symbol: $i = \sqrt{-1}$
4. Imaginary number: i

Note the Pattern:

$$i = \sqrt{-1}$$
$$i^2 = (\sqrt{-1})^2 = -1$$
$$i^3 = i^2 \cdot i = -1 \cdot i = -i$$
$$i^4 = i^2 \cdot i^2 = (-1)(-1) = 1$$
$$i^5 = i^4 \cdot i = (1)i = i$$
$$i^6 = i^4 i^2 = (1)(-1) = -1$$
$$i^7 = i^6 \cdot i = (-1)i = -i$$
$$i^8 = i^4 i^4 = (1)(1) = 1$$
$$i^9 = i^8 \cdot i = (1)i = i$$
$$\vdots$$

Example 1: Simplify

A. $\sqrt{-16}$ B. $\sqrt{-50}$ C. $\sqrt{-2} \cdot \sqrt{-18}$

Example 2: Simplify

A. $\dfrac{4 \pm \sqrt{-12}}{2}$

Operations with complex numbers:

Example 3: Simplify

A. $(4+5i)+(-3+4i)$

B. $(18-i)-(-4-7i)$

C. $(6-i)(5i)$

D. $(2-i)(3+i)$

E. $(3+2i)(3-2i)$

Conjugates!

Rationalizing the denominator: (use the conjugate)

Example 4: Simplify

A. $\dfrac{5}{3-\sqrt{2}}$

B. $\dfrac{1-2i}{2+9i}$

C. $\dfrac{\sqrt{-9}}{(1-2i)}$

Example 5: Solve

A. $2x^2+4x+7=0$