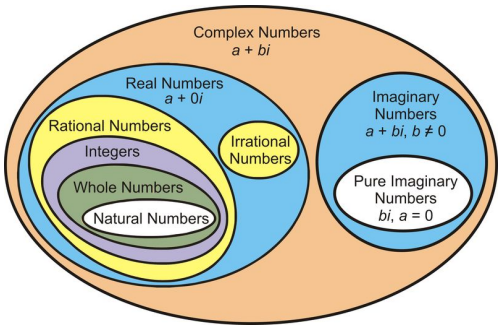
Can you solve $x^2 = -1$?



Complex Number

$$i = \sqrt{-1}, \text{ so } i^2 = -1$$

If a and b are real numbers, then any number of the form

$$a + bi$$

is a complex number. In the complex number $a + bi$, a is the real part and b is the imaginary part

Two complex numbers $a + bi$ and $c + di$ are equal provided that their real parts are equal and their imaginary parts are equal → that is, they are equal if and only if $a = c$ and $b = d$.

Standard Form: $a + bi$

$$\sqrt{-a} = i\sqrt{a}$$

Caution:

First apply the definition $\sqrt{-a} = i\sqrt{a}$ before using any of the other rules for radicals.

1. Write each number as the product of a real number and i
   a. $\sqrt{-16}$ b. $\sqrt{-70}$

2. Find each product or quotient. Simplify your answers.
   a. $\sqrt{-17} \cdot \sqrt{-17}$ b. $\frac{\sqrt{-70}}{\sqrt{-7}}$ c. $\frac{\sqrt{-12} \cdot \sqrt{-6}}{\sqrt{8}}$

3. Write each number in standard form $a + bi$

   a. $\frac{-9-\sqrt{-18}}{3}$

   b. $\frac{20+\sqrt{-8}}{2}$

4. Find each sum or difference. Write answers in standard form.

   a. $(4 - i) + (8 + 5i)$

   b. $(-3 + 2i) - (-4 + 2i)$

5. Find each product. Write answers in standard form.

   a. $(-2 + 3i)(4 - 2i)$

   c. $(\sqrt{2} - 4i)(\sqrt{2} + 4i)$

   b. $(2 + i)^2$

Property of Complex Conjugates

For real numbers a and b,

$$(a + bi)(a - bi) = a^2 + b^2$$

6. Find each quotient. Write answers in standard form.

   a. $\frac{-5}{i}$ b. $\frac{-3+4i}{2-i}$ c. $\frac{14+5i}{3+2i}$

7. Simplify each power of i

   a. i^{29} b. i^{40}