# Complex Numbers



Real

- Counting Numbers $1, 2, 3, 4, \ldots$
- Whole Numbers $0, 1, 2, 3, 4 \ldots$
- Integers $\ldots -3, -2, -1, 0, 1, 2, 3 \ldots$
- Rational Numbers $\frac{p}{q}$ where $p$ & $q$ are integers ($q \neq 0$) (terminating or repeating decimal)
- Irrational Numbers $\pi, \sqrt{2}, \sqrt{3}$

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

$\sqrt{-7} = \sqrt{-1} \cdot \sqrt{7} = i\sqrt{7}$

$\sqrt{-12} = \sqrt{-1} \cdot \sqrt{12} = i\sqrt{4} \cdot \sqrt{3} = 2i\sqrt{3}$

Solve: $2x^2 + 18 = -72$

$-18 \quad -18$

$2x^2 = -90$

$x^2 = -45$

$\sqrt{x^2} = \sqrt{-45}$

$x = \pm\sqrt{-45}$

$x = \pm\sqrt{-1} \cdot \sqrt{45}$

$x = \pm i\sqrt{9}\sqrt{5}$

$x = \pm 3i\sqrt{5}$

Solve: $\frac{-4(n-2)^2}{-4} = \frac{20}{-4}$

$\sqrt{(n-2)^2} = \sqrt{-5}$

$n - 2 = \pm\sqrt{-5}$

$n - 2 = \pm i\sqrt{5}$

$+2 \quad +2$

$n = 2 \pm i\sqrt{5}$

1) $(-8+8i)-1(2+4i)$

$-8+8i-2-4i$

$-10+4i$

11) $(-1+3i)(1+6i)$

$-1-6i+3i+18i^2$

$-1-3i+18(-1)$

$-1-3i-18$

$-19-3i$

31) $\frac{8}{7+8i} \cdot \frac{7-8i}{7-8i} = \frac{8(7-8i)}{(7+8i)(7-8i)}$

$\frac{56-64i}{49-64i^2} = \frac{56-64i}{49-64(-1)}$

$= \frac{56-64i}{49+64} = \frac{56-64i}{113}$

$= \frac{56}{113} - \frac{64}{113}i$