

$$\sqrt{-49} = 7i$$

Operations of Complex Numbers

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

Complex Number Standard Form

$$a + bi$$

$$i^2 = -1$$

Conjugate

$$(a + bi)(a - bi)$$

$$i + 6i$$

$$-1 - 8i - 4 - i$$

$$-3 + 6i - (-5 - 3i) - 8i$$

$$\frac{4i(-2 - 8i)}{}$$

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

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

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

$$-8 - 2i - 4i - i^2$$

$$-8 - 6i - i^2$$

$$-8 - 6i - (-1)$$

$$-8 - 6i + 1$$

$$-7 - 6i$$

$$(8 + 3i)^2$$

$$(8 + 3i)(8 + 3i)$$

$$64 + 24i + 24i + 9i^2$$

$$64 + 48i - 9$$

$$55 + 48i$$

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

$$4 - 6i + 6i - 9i^2$$

$$4 + 9$$

$$13$$

$$\frac{3 - 2i(1 - i)}{1 + i(1 - i)} = \frac{3 - 3i - 2i + 2i^2}{1 - i + i - i^2}$$

$$\frac{1 - 5i}{2}$$

$$\frac{5 + 2i(2 + 3i)}{(2 - 3i)(2 + 3i)}$$

$$\frac{10 + 15i + 4i + 6i^2}{4 + 6i - 6i - 9i^2}$$

$$\frac{4 + 19i}{13}$$

$$\frac{(5 - 9i)(5 - 9i)}{(5 + 9i)(5 - 9i)}$$

$$\frac{25 - 45i - 45i + 81i^2}{25 - 45i + 45i - 81i^2}$$

$$\frac{-54 - 90i}{106}$$

$$\frac{4}{13} + \frac{19}{13}i$$

$$\frac{-54}{106} - \frac{90}{106}i$$

Discriminant	Find the value of the discriminant. <u>Tell how many solutions and classify the solutions.</u>	
$b^2 - 4ac$	<u>Rational, Irration, Complex</u>	
$b^2 - 4ac > 0$ 2 Real Solutions	$a=3 \quad b=14 \quad c=-5$ $3x^2 + 14x - 5 = 0$ $b^2 - 4ac$ $14^2 - 4(3)(-5)$ $196 - (-60)$ 256 2 Real Solutions Rational	$4x^2 + 12x + 9 = 0$ $12^2 - 4(4)(9)$ $144 - 144$ 0 1 Real Solution Rational
$b^2 - 4ac = 0$ 1 Real Solution	$-3x^2 + 5x - 6 = 0$ $5^2 - 4(-3)(-6)$ $25 - 72$ -47 2 complex Solutions Complex	$a^2 + 10a + 9 = 0$ $10^2 - 4(1)(9)$ $100 - 36$ 64 2 Real Solutions Rational
$b^2 - 4ac < 0$ 2 complex Solutions	$2x^2 - x - 3 = 0$ $(-1)^2 - 4(2)(-3)$ $1 - (-24)$ 25 2 Real Solutions Rational	$5x^2 + 125 = 0$ $0^2 - 4(5)(125)$ -2500 2 complex Complex
Discriminant a perfect square Rational Solution		

Solve Each Quadratic. Tell whether the solution is rational, irrational, or complex

$$-10 = -\frac{40}{4} + \frac{25}{4}$$

$$x^2 - 5x + 10 = 0$$

$$x^2 - 5x + \frac{25}{4} = -10 + \frac{25}{4}$$

$$\sqrt{\left(x - \frac{5}{2}\right)^2} = \sqrt{\frac{-15}{4}}$$

$$x - \frac{5}{2} = \pm \frac{\sqrt{-15}}{2}$$

$$x = \frac{5}{2} \pm \frac{\sqrt{15}i}{2}$$

Complex

$$-x^2 + 5x - 6 = 0$$

$$x^2 - 5x + 6 = 0$$

$$(x-3)(x-2) = 0$$

$$x-3=0 \quad x-2=0$$

$$x=3 \quad x=2$$

$$x^2 + 6x + 12 = 0$$

$$x^2 + 4x + 2 = 0$$

$$x^2 + 4x + 4 = -2 + 4$$

$$(x+2)^2 = 2$$

$$x+2 = \pm\sqrt{2}$$

$$x = -2 \pm \sqrt{2}$$

Irrational

$$a^2 - 5a + 8 = 0$$

$$a^2 - 5a + \frac{25}{4} = -8 + \frac{25}{4}$$

$$-\frac{32}{4} + \frac{25}{4}$$

$$\left(a - \frac{5}{2}\right)^2 = -\frac{7}{4}$$

$$a - \frac{5}{2} = \pm\sqrt{\frac{-7}{4}}$$

$$a = \frac{5}{2} \pm \frac{\sqrt{7}i}{2}$$

$$10x^2 - 11x + 9 = 13x - 6x^2$$

$$16x^2 - 24x + 9 = 0$$

$$24^2 - 4(16)(9) = 0$$

$$(4x-3)(4x-3) = 0$$

$$x = \frac{3}{4}, x = \frac{3}{4}$$

Rational