Solve by Completing the Square

Steps:

1. Remember *a must be = 1* to use this method.
2. *Isolate* $x^2 + bx$ on left side of the equal sign and the constant *c* on the right side.
3. *Take ½* of the coefficient *b* of the *bx* term.
4. *Square that result* and *add* that to *both sides* of the equation.
5. *Create (factor) a perfect square... Left side will be in the form:* $(x - b/2)^2$ *or* $(x + b/2)^2$
6. *Take the square root* of *both sides* to isolate the variable. *Don't forget the* ±

Find the value of c that completes the square:

$x^2 - 6x + c$

$\frac{b}{2} = 3$ $3^2 = 9$ $c = 9$

$x^2 + 12x + c$

$\frac{12}{2} = 6$ $6^2 = 36$ $c = 36$

Solve the equation by completing the square:

$x^2 - 8x + 12 = 0$

$-12 \quad -12$

$x^2 - 8x + 16 = -12 + 16$

$\sqrt{(x-4)^2} = \sqrt{4}$

$x = 4 \pm 2$

$x = 6, \; x = 2$

$x^2 - 6x - 14 = 0$

$+14 \quad +14$

$x^2 - 6x + 9 = 14 + 9$

$\sqrt{(x-3)^2} = \sqrt{23}$

$x = 3 \pm \sqrt{23}$

$x^2 - 8x + 25 = 0$

$-25 \quad -25$

$x^2 - 8x + 16 = -25 + 16$

$\sqrt{(x-4)^2} = \sqrt{-9}$

$x = 4 \pm 3i$

$x^2 - 2x + 3 = 0$

$-3 \quad -3$

$x^2 - 2x + 1 = -3 + 1$

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

$x = 1 \pm i\sqrt{2}$

$x^2 - 14x = 4$

$x^2 - 14x + 49 = 4 + 49$

$\sqrt{(x-7)^2} = \sqrt{53}$

$x = 7 \pm \sqrt{53}$

$x^2 - 10x = -49$

$x^2 - 10x + 25 = -49 + 25$

$\sqrt{(x-5)^2} = \sqrt{-24}$

$x = 5 \pm 2i\sqrt{6}$