Completing the Square - 4/4/2013 www.askmath.weebly.com

Completing the square is just another method to solve for x in a quadratic equation. Because there are two x's in a quadratic equation (usually), completing the square can help.

NOTE: Quadratic formula will always work. However completing the square is sometimes better.

NOTE: The Quadratic formula $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ comes from completing the square.

$ax^2 + bx + c = 0$

If a is equal to 1

Ex. Solve for x. $x^2 - 6x + 4 = 0$

$$x^2 - 6x + 4 = 0$$
$$x^2 - 6x = -4 \text{ Subtract the constant to the other side. In this case is } 4.$$
$$x^2 - 6x + 9 = -4 + 9 \text{ Do } \left(\frac{b}{2}\right)^2 \text{. Add this on to the other side as well.}$$
$$(x-3)^2 = 5 \text{ Factor the left side.}$$
$$x - 3 = \pm\sqrt{5} \text{ Take the square root of both sides.}$$
$$x = \boxed{3 \pm \sqrt{5}} \text{ Add the 3 to the other side.}$$

If a is greater than 1

Ex. Solve for x. $2x^2 + 5x - 2 = 0$

$$2x^2 + 5x - 2 = 0$$
$$2x^2 + 5x = 2 \text{ Bring the constant to the other side.}$$
$$2\left(x^2 + \frac{5}{2}x\right) = 2 \text{ Factor out } a.$$
$$2\left(x^2 + \frac{5}{2}x + \frac{25}{16}\right) = 2 \times \frac{25}{16} + 2 \text{ Do } \left(\frac{b}{2}\right)^2 \text{. Then multiply this by } a \text{ and add it to the other side.}$$
$$2\left(x + \frac{5}{4}\right)^2 = \frac{41}{8} \text{ Factor.}$$
$$\left(x + \frac{5}{4}\right)^2 = \frac{\frac{41}{8}}{2}$$
$$x + \frac{5}{4} = \pm\sqrt{\frac{41}{16}}$$
$$x = \boxed{-\frac{5}{4} \pm \frac{\sqrt{41}}{4}}$$