



Math Study Strategies

Completing the square

This technique can be used to solve all quadratic equations in standard form.

Follow the steps below to complete the square.

- 1) Make sure the coefficient the x^2 term is 1. If it is not, make it 1 by dividing all terms on both sides of the equation by the coefficient of x^2 .
- 2) If the constant term is not isolated (by itself on one side of the equation), isolate it now.
- 3) Complete the square
 - a. Find $1/2$ of the coefficient of the x term (not the x^2 term) and square it. For example, if the coefficient of the x term is 6, find one half of 6 (3) and then square it ($3^2 = 9$).
 - b. Add this number to both sides of the equation.
- 4) Factor the trinomial and solve the equation using the square root property

Example:

Complete the square to solve $x^2 + 8x + 7 = 0$

In this example, the coefficient of x^2 is understood as 1, so **Step 1** is complete.

$$\begin{array}{r} x^2 + 8x + 7 = 0 \\ \quad \quad \quad -7 = -7 \\ \hline x^2 + 8x \quad = -7 \\ x^2 + 8x = -7 \end{array}$$

Step 2: subtract 7 from both sides to isolate the constant

$$\left(\frac{1}{2} \times 8\right)^2 = 16$$

Step 3a: the coefficient of x is 8, $1/2$ of 8 is 4, and $4^2 = 16$

$$x^2 + 8x + 16 = 16 - 7$$

Step 3b: add 16 to both sides

$$\begin{array}{l} x^2 + 8x + 16 = 9 \\ (x + 4)^2 = 9 \end{array}$$

Step 4: the left side of the equation is a perfect square trinomial, so we can factor it. Next, using the square root property, take the square root of both sides and solve for x .

$$\begin{array}{l} \sqrt{(x + 4)^2} = \sqrt{9} \\ x + 4 = \pm\sqrt{9} \end{array}$$

$$\begin{array}{l} x + 4 = 3 \quad \text{or} \quad x + 4 = -3 \\ x = -1 \quad \quad \text{or} \quad x = -7 \end{array}$$

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