The Square Root Property

Recall:

$$x^2 = 9$$

Since this is a quadratic equation, we must set it equal to zero, factor, set each factor equal to zero, and solve.

$$x^2 = 9$$
$$x^2 - 9 = 0$$
$$(x + 3)(x - 3) = 0$$

$$x + 3 = 0 \qquad x - 3 = 0$$
$$x = -3 \qquad x = 3$$

Solving the equation mentally, we should ask ourselves, "what number when squared gives us 9?"

3 squared is 9 and (-3) squared is 9.

We know we should get 2 answers for a quadratic. When we want to solve this equation we can square root both sides, but we must keep in mind that there are two possible results: one positive and one negative.

$$x^2 = 9$$
$$\sqrt{x^2} = \pm\sqrt{9}$$
$$x = \pm 3$$

Note: Recall that the symbol $\pm$ means "plus or minus". When taking the square root of both sides of an equation, we add $\pm$ to indicate both the positive AND negative solution.

Example 1:

Solve using the square root property.

a.) $\boldsymbol{x^2 = 16}$

b.) $\boldsymbol{x^2 = 12}$

c.) $\boldsymbol{x^2 + 1 = 26}$

Here we want to isolate the $\boldsymbol{x^2}$ so we can use the square root property.

$$x^2 + 1 = 26 \qquad \text{Subtract } \mathbf{1}$$
$$\boldsymbol{x^2 = 25} \qquad \text{Square root prop.}$$
$$\boldsymbol{\sqrt{x^2} = \pm\sqrt{25}} \qquad \text{Simplify}$$
$$\boldsymbol{x = \pm 5}$$

Example 2:

Solve using the square root property.

a.) $\boldsymbol{(x+1)^2 = 8}$

$$(x+1)^2 = 8$$
$$\boldsymbol{\sqrt{(x+1)^2} = \pm\sqrt{8}} \qquad \text{Square root prop.}$$
$$\boldsymbol{x + 1 = \pm\sqrt{8}} \qquad \text{Simplify}$$
$$\boldsymbol{x + 1 = \pm 2\sqrt{2}} \qquad \text{Simplify}$$
$$\boldsymbol{x = -1 \pm 2\sqrt{2}} \qquad \text{Subtract } \mathbf{1}$$

b.) $\mathbf{3x^2 - 1 = 14}$

$\mathbf{3x^2 - 1 = 14}$	Add $\mathbf{1}$
$\mathbf{3x^2 = 15}$	Divide $\mathbf{3}$
$\mathbf{x^2 = 5}$	Square root prop.
$\mathbf{\sqrt{x^2} = \pm\sqrt{5}}$	Simplify
$\mathbf{x = \pm\sqrt{5}}$	

c.) $\mathbf{7x^2 - 10 = 46}$

The Square Root Property — Practice Problems

Solve each equation using the square root property.

1. $\boldsymbol{x^2 = 100}$

2. $\boldsymbol{x^2 + 5 = 30}$

3. $\boldsymbol{2x^2 - 3 = 21}$

4. $\boldsymbol{(x + 3)^2 = 9}$