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.

\[ x^2 = 9 \]
\[ x^2 - 9 = 0 \]
\[ (x + 3)(x - 3) = 0 \]

\[ x + 3 = 0 \quad x - 3 = 0 \]
\[ x = -3 \quad x = 3 \]

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 ± means “plus or minus”. When taking the square root of both sides of an equation, we add ± to indicate both the positive AND negative solution.
Example 1:

Solve using the square root property.

a.) $x^2 = 16$

b.) $x^2 = 12$

c.) $x^2 + 1 = 26$

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

$$x^2 + 1 = 26 \quad \text{Subtract 1}$$

$$x^2 = 25 \quad \text{Square root prop.}$$

$$\sqrt{x^2} = \pm\sqrt{25} \quad \text{Simplify}$$

$$x = \pm 5$$

Example 2:

Solve using the square root property.

a.) $(x + 1)^2 = 8$

$$(x + 1)^2 = 8$$

$$\sqrt{(x + 1)^2} = \pm\sqrt{8} \quad \text{Square root prop.}$$

$$x + 1 = \pm\sqrt{8} \quad \text{Simplify}$$

$$x + 1 = \pm 2\sqrt{2} \quad \text{Simplify}$$

$$x = -1 \pm 2\sqrt{2} \quad \text{Subtract 1}$$
b.) \(3x^2 - 1 = 14\)

\[
3x^2 - 1 = 14
\]

\[
3x^2 = 15
\]

\[
x^2 = 5
\]

\[
\sqrt{x^2} = \pm\sqrt{5}
\]

\[
x = \pm\sqrt{5}
\]

Add 1

Divide 3

Square root prop.

Simplify

c.) \(7x^2 - 10 = 46\)
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Practice Problems

Solve each equation using the square root property.

1. $x^2 = 100$

2. $x^2 + 5 = 30$

3. $2x^2 - 3 = 21$

4. $(x + 3)^2 = 9$