

Day 3: Solving by Finding Square Roots

Review: If possible, simplify the following radicals completely.

a. $\sqrt{25}$

$$\boxed{5}$$

b. $\sqrt{125}$

$$\frac{\sqrt{25} \sqrt{5}}{\boxed{5\sqrt{5}}}$$

c. $\sqrt{24}$

$$\frac{\sqrt{4} \sqrt{6}}{\boxed{2\sqrt{6}}}$$

Explore: Solve the following equations for x:

a. $\sqrt{x^2} = \sqrt{16}$

$$x = 4$$

b. $\sqrt{x^2} = \sqrt{4}$

$$x = 2$$

c. $\sqrt{x^2} = \sqrt{9}$

$$x = 3$$

d. $\sqrt{x^2} = \sqrt{1}$

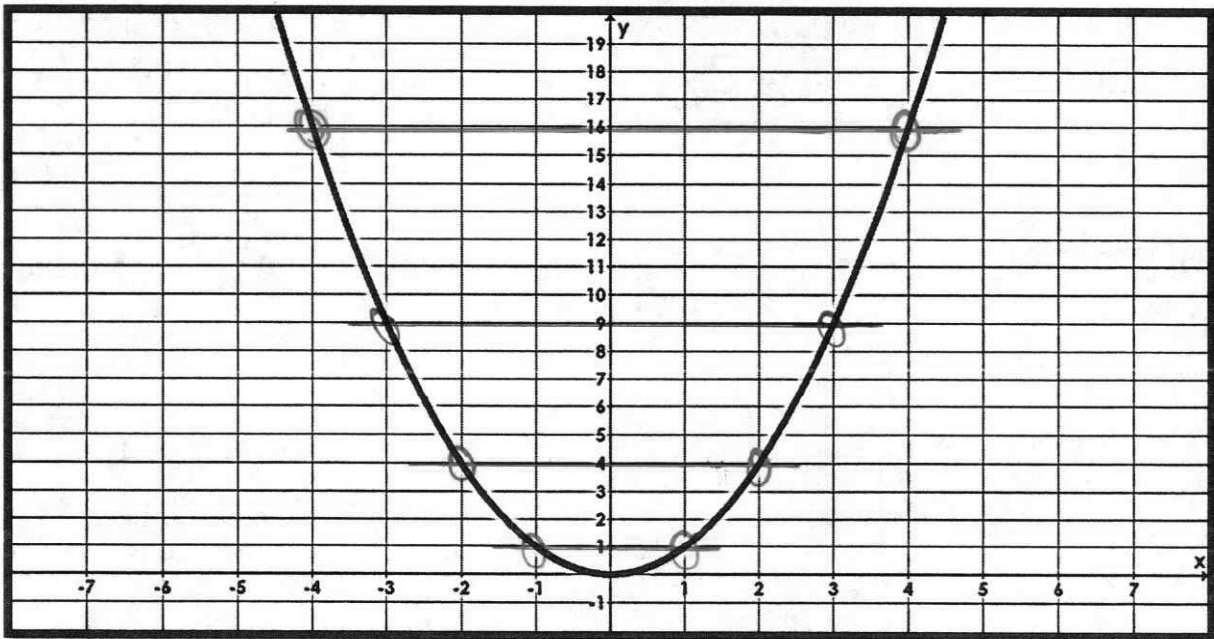
$$x = 1$$

What operation did you perform to solve for x?

square root

How many of you only had one number as an answer for each equation?

Well, let's take a look at the graph of this function.



After looking at the graph, what values of x produce a y value of 1, 4, 9, and 16?

$$1 \rightarrow -1 \text{ \& } 1 \quad 4 \rightarrow -2 \text{ \& } 2 \quad 9 \rightarrow -3, 3 \quad 16 \rightarrow -4, 4$$

What would be your new answers for the previous equations?

a. $x^2 = 16$

$$-4 \text{ \& } 4$$

b. $x^2 = 4$

$$-2 \text{ \& } 2$$

c. $x^2 = 9$

$$-3 \text{ \& } 3$$

d. $x^2 = 1$

$$-1 \text{ \& } 1$$

In order to be successful at today's lesson, you need to understand two things: how to solve a linear equation and understand that square roots and squares are inverses of each other.

Key Idea #1: Solving a Linear Equation:

S/A D/M E P = SADMEP

Practice: Solve the following equations for x:

a. $2x + 8 = 12$

$$\begin{array}{r} -8 \quad -8 \\ \hline 2x = 4 \\ \frac{2}{2} \quad \frac{2}{2} \\ \hline \boxed{x = 2} \end{array}$$

b. $3(x + 5) = 6$

$$\begin{array}{r} \cancel{3} \quad \cancel{3} \\ \hline x + 5 = 2 \\ -5 \quad -5 \\ \hline \boxed{x = -3} \end{array}$$

c. $10x + 9 = 499$

$$\begin{array}{r} -9 \quad -9 \\ \hline 10x = 490 \\ \frac{10}{10} \quad \frac{10}{10} \\ \hline \boxed{x = 49} \end{array}$$

Key Idea #2: Square Roots and Squares

$$5 \rightarrow (5)^2 \rightarrow 25 \rightarrow \sqrt{25} \rightarrow 5$$

Squaring a number and taking the square root of a number undo each other (you end up with what you started with).

Practice: Take the following numbers and square them; then take the square root of your new number to show how you end up with the number you started with.

$$7 \rightarrow (7)^2 \rightarrow 49 \rightarrow \sqrt{49} \rightarrow 7$$

$$3 \rightarrow (3)^2 \rightarrow 9 \rightarrow \sqrt{9} \rightarrow 3$$

Solving by Taking Square Roots without Parentheses

Steps for Solving Quadratics by Finding Square Roots

1. Add or Subtract any constants that are on the same side of x^2 .
2. Multiply or Divide any constants from x^2 terms. "Get x^2 by itself"
3. Take square root of both sides and set equal to positive and negative roots (\pm).

Ex: $x^2 = 25$

$\sqrt{x^2} = \sqrt{25}$

$x = \pm 5$

$x = +5$ and $x = -5$

REMEMBER WHEN SOLVING FOR X YOU GET A pos AND neg
ANSWER!

Solve the following for x:

1) $x^2 = 49$

$x = -7$ $x = 7$

OR

$x = \pm 7$

4) $\frac{3x^2}{3} = \frac{108}{3}$

$x^2 = 36$

$x = \pm 6$

2) $\sqrt{x^2} = \sqrt{20}$

$\sqrt{4} \sqrt{5}$

$x = 2\sqrt{5}$ & $x = -2\sqrt{5}$

OR

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

5) $\frac{2x^2}{2} = \frac{128}{2}$

$x^2 = 64$

$x = \pm 8$

3) $\sqrt{x^2} = \sqrt{7}$

$x = \sqrt{7}$ $x = -\sqrt{7}$

OR

$x = \pm \sqrt{7}$

6) $x^2 - 11 = 14$

$+11$ $+11$

$x^2 = 25$

$x = \pm 5$

7) $7x^2 - 6 = 57$

$+6$ $+6$

$\frac{7x^2}{7} = \frac{63}{7}$

$x^2 = 9$

$x = \pm 3$

8) $2x^2 + 8 = 170$

-8 -8

$\frac{2x^2}{2} = \frac{162}{2}$

$x^2 = 81$

$x = \pm 9$

9) $x^2 = 0$

$x = 0$ * only 1 answer

10) $10x^2 + 9 = 499$

-9 -9

$\frac{10x^2}{10} = \frac{490}{10}$

$x^2 = 49$

$x = \pm 7$

11) $4x^2 - 6 = 74$

$+6$ $+6$

$\frac{4x^2}{4} = \frac{80}{4}$

$x^2 = 20$

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

12) $3x^2 + 7 = 301$

-7 -7

$\frac{3x^2}{3} = \frac{294}{3}$

$x^2 = 98$

$\sqrt{49} \sqrt{2}$

$x = \pm 7\sqrt{2}$