Day 3: Solving by Finding Square Roots

Review: If possible, simplify the following radicals completely.

a. $\sqrt{25}$ b. $\sqrt{125}$ c. $\sqrt{24}$

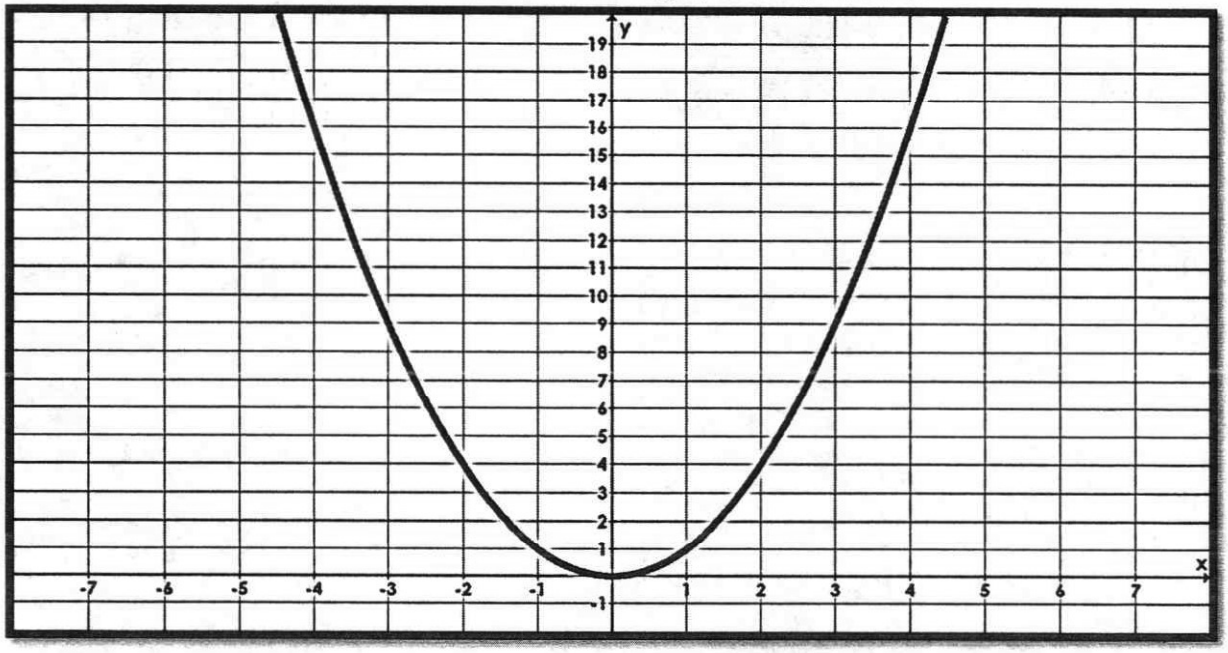
Explore: Solve the following equations for x:

a. $x^2 = 16$ b. $x^2 = 4$ c. $x^2 = 9$ d. $x^2 = 1$

What operation did you perform to solve for x?

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?

What would be your new answers for the previous equations?

a. $x^2 = 16$ b. $x^2 = 4$ c. $x^2 = 9$ d. $x^2 = 1$

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. $2x + 8 = 12$ b. $3(x + 5) = 6$

c. $10x + 9 = 499$

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 → → → →

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 (±).

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 _____ AND _____ ANSWER!

Solve the following for x:

1) $x^2 = 49$

2) $x^2 = 20$

3) $x^2 = 7$

4) $3x^2 = 108$

5) $2x^2 = 128$

6) $x^2 - 11 = 14$

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

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

9) $x^2 = 0$

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

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

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

Applications of Solving by Square Roots

Falling Objects: $h = -16t^2 + h_0$ **h_0 = starting height, h = ending height**

1. The tallest building in the USA is in Chicago, Illinois. It is 1450 ft tall. How long would it take a penny to drop from the top of the building to the ground?

2. When an object is dropped from a height of 72 feet, how long does it take the object to hit the ground?

Application:

3. For a period of 48 months, the average monthly operating costs for a small business C (in dollars) is approximated by the model $C = 0.55t^2 + 550$, where t is the number of months. During which month was the average operating cost $1430?

Day 3 – Solving by Square Roots (SIMPLE)

Name: _____

Practice Assignment

Directions: Solve each of the following equations.

1. $x^2 = 64$

2. $x^2 = 96$

3. $x^2 - 9 = 16$

4. $x^2 - 1 = 80$

5. $10x^2 + 8 = 498$

6. $2x^2 - 5 = 27$

7. $4x^2 + 7 = 23$

8. $2x^2 + 3 = 93$

9. $10x^2 + 6 = 326$

10. $2x^2 + 10 = 34$

Falling Object:

$$h(t) = -16t^2 + h_0$$

How long will it take to reach the ground?

11. You drop a rock off a cliff that is 520 feet high.

12. You drop your pencil off your desk that is 3 feet high.

Application:

13. For a period of 48 months, the average monthly operating costs for a small business C (in dollars) is approximated by the model $C = 0.55t^2 + 550$, where t is the number of months. During which month was the average operating cost $1045?

Day 4 Solving by Finding Square Roots (More Complicated)

Steps for Solving Quadratics by Finding Square Roots with Parentheses

1. Add or Subtract any constants outside of any parenthesis.
2. Multiply or Divide any constants around parenthesis/squared term. "Get ( )^2 by itself"
3. Take square root of both sides and set your expression equal to BOTH the positive and negative root (±). Ex: $(x + 4)^2 = 25$

$\sqrt{(x + 4)^2} = \sqrt{25}$

$(x + 4) = \pm 5$

$x + 4 = +5$ and $x + 4 = -5$

$x = 1$ and $x = -9$

4. Add, subtract, multiply, or divide any remaining numbers to isolate x.

REMEMBER WHEN SOLVING FOR X YOU GET A POSITIVE AND NEGATIVE ANSWER!

Solve the following for x:

1) $(x-4)^2 = 81$

2) $(p-4)^2 = 16$

3) $10(x-7)^2 = 440$

4) $\frac{1}{2}(x+8)^2 = 14$

5) $-2(x+3)^2 - 16 = -48$

6) $3(x-4)^2 + 7 = 67$

Solving Literal Equations with Quadratic Equations

A literal equation is an equation with more than one variable. When solving literal equations, you would use the properties of equality to isolate the variable you are solving for and treat the other variables like constants.

1. Solve for s: $A = 6s^2$

2. Solve for r: $A = \pi r^2$

3. Solve for r: $A = \frac{\pi r^2 s}{360}$

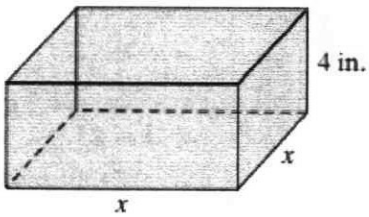
4. Solve for b: $a^2 + b^2 = c^2$.

5. Solve for c: $E = mc^2$

6. Solve for s: $V = \frac{1}{3}s^2h$

7. The formula for finding the volume of a square pyramid is $V = 1/3s^2h$, where s represents the side length of the square base and *h* represents the height. What equation could be used to find the height of the square pyramid?

8. The volume of a box with a square bottom and a height of 4 in is given by $V(x) = 4x^2$, where x is the length (in inches) of the sides of the bottom of the box.



a. If the volume of the box is 289 in^3, find the dimensions of the box.

Day 4 – Solving by Square Roots (COMPLEX) **Name:** _____

Practice Assignment

Directions: Solve each equation. Put your answers in decimal form AND simplest radical form (if necessary).

1. $(x - 3)^2 = 4$

2. $5(x - 4)^2 = 125$

3. $4(x + 1)^2 = 100$

4. $(x - 5)^2 - 100 = 0$

5. $5(x - 1)^2 = 50$

6. $-3(x + 2)^2 = -18$

7. $5(x - 7)^2 = 135$

8. $8(x + 4)^2 = 96$

9. $\frac{1}{4}(x-8)^2 = 7$

10. $(2x-5)^2 = 81$

11. $2(x-6)^2 - 45 = 53$

12. $5(x+4)^2 - 3 = 17$

Directions: Solve for the indicated variable.

13. $V = \frac{1}{3}\pi r^2 h$ solve for r

14. $a^2 + b^2 = c^2$ solve for b

15. $E = \frac{1}{2}mv^2$ solve for v

16. $y = a(x-h)^2 + k$ solve for x