Lesson 1.6 Square and Cube Roots (Day 1)

Objective

*I can evaluate and solve problems with square and cube roots.

- **Common Core State Standards** *8EE1 & 8.E.E.2 Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.*
- **Mathematical Practices** 4. Model mathematics. 5. Use tools strategically. 6. Attend to precision. *MP 7 Look for and use structure*

Lesson 1.6 Square and Cube Roots (Day 1)

Perfect Squares Tiles Activity

Learning Target:_____

_____

1. Using the square tiles, make the smallest perfect square you can.

    a. How many tiles did you use?

    b. What are the dimensions of your square (length and width)?

2. Using more tiles, make the next smallest perfect square you can.

    a. How many tiles did you use?

    b. What are the dimensions of your square (length and width)?

3. Make the next smallest perfect square you can.

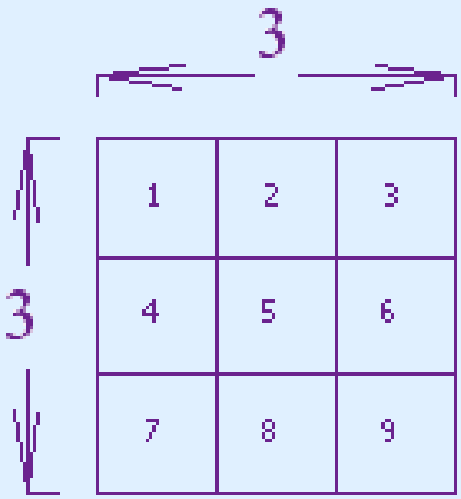
    a. How many tiles did you use?

    b. What are the dimensions of your square (length and width)?

A Number that is a Perfect	Dimensions of the Square (length x width)	What is the Square Root of the Perfect Square Number?
Example: 1	$1X1= 1^2$	1

Lesson 1.6 Square and Cube Roots (Day 1)

To square a number, just multiply it by itself

3 Squared = 

$= 3 \times 3 = \mathbf{9}$

3^2

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Negative Numbers

You can also square negative numbers.

Example: What is $(-5)^2$?

Answer:

$$(-5) \times (-5) = \mathbf{25}$$

(because a negative times a negative gives a positive)

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Example

Find the two square roots of 49.

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Example

Find the two square roots of 49.

Solution

$\sqrt{49} = 7$ 7 is the positive square root of 49 since $7 \cdot 7 = 49$.

and

$-\sqrt{49} = -7$ -7 is the negative square root of 49 since $(-7) \cdot (-7) = 49$.

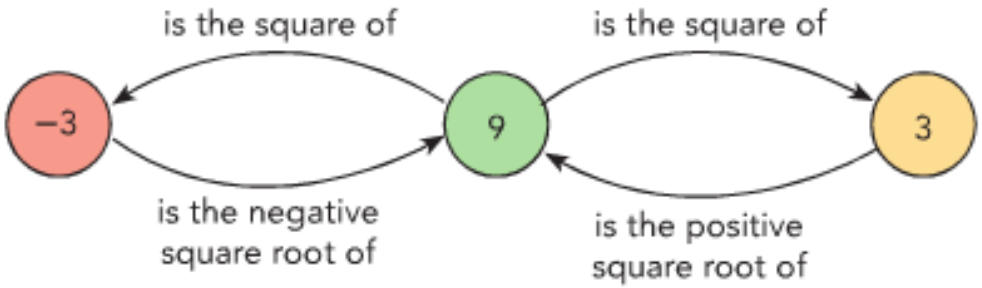
Caution

Because $\sqrt{49}$ is the positive square root of 49, $\sqrt{49} \neq -7$

Lesson 1.6 Square and Cube Roots (Day 1)

Evaluate Square Roots of Positive Real Numbers.

When you multiply a number by itself, you are squaring that number, or raising it to the second power. For example, $3^2 = 9$ and $(-3)^2 = 9$.



You can use $\sqrt{9} = 3$ to indicate the positive square root of 9, and $-\sqrt{9} = -3$ to indicate the negative square root of 9.

Not every number has a square root. For example, -9 has no square root, because there are no two identical factors of -9. Both $(-3)^2$ and 3^2 are equal to 9.

Lesson 1.6 Square and Cube Roots (Day 1)

Guided Practice

Solve. Show your work.

1. Find the two square roots of 169.

Lesson 1.6 Square and Cube Roots (Day 1)

Guided Practice

Solve. Show your work.

1. Find the two square roots of 169.

$\sqrt{169} = \underline{?}$ 13

$\underline{?}$ is the positive square root of 169 since $\underline{?} \cdot \underline{?} = 169$.

13; 13; 13

and

$-\sqrt{169} = \underline{?}$ −13

$\underline{?}$ is the negative square root of 169 since $\underline{?} \cdot \underline{?} = 169$.

−13; −13; −13

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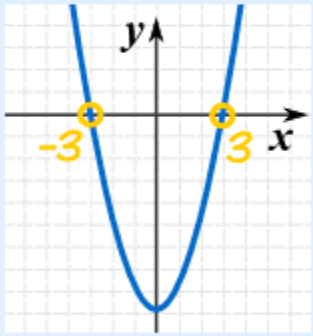
Why Is This Important?

Why is this "plus or minus" Important? Because you don't want to miss a solution!

Example: Solve $x^2-9 = 0$



Start with: $x^2-9 = 0$

Move 9 to right: $x^2 = 9$

Take Square Root: $x = \pm\sqrt{9}$

Answer: $x = \pm 3$

If we don't remember the "±" we would miss the "-3" answer

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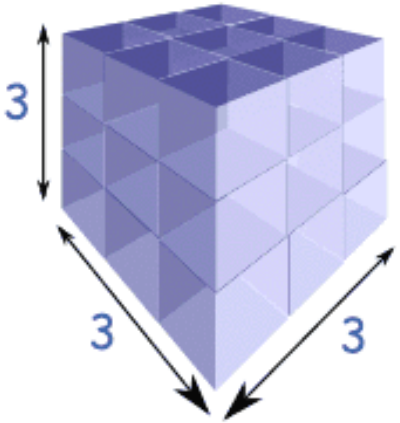
To understand cube roots, first we must understand cubes

How to Cube A Number

To **cube** a number, just use it in a multiplication **3 times** ...

Example: What is 3 Cubed?

3 Cubed =



$= 3 \times 3 \times 3 = 27$

3^3

Lesson 1.6 Square and Cube Roots (Day 1)

Perfect Cubed Sugar Activity

1. Using the sugar cubes, make the smallest perfect cube you can.
    a. How many cubes did you use?
    b. What are the dimensions of the cubes length?
2. Using more sugar cubes, make the next smallest perfect cube you can.
    a. How many cubes did you use?
    b. What are the dimensions of the cubes length?
3. Make the next smallest perfect cube you can.
    a. How many cubes did you use?
    b. What are the dimensions of the cubes length?

A Number that is a Perfect	Dimensions of the Cube (a^3)	What is the Cube Root of the Perfect Cube Number?
Example: 1	$1x1x1= 1^3$	1

Lesson 1.6 Square and Cube Roots (Day 1)

Find the cube root of 343.

Lesson 1.6 Square and Cube Roots (Day 1)

Find the cube root of 343.

Solution

$\sqrt[3]{343} = \sqrt[3]{7^3}$ — 7 is a cube root since $7 \cdot 7 \cdot 7 = 343$.

$= 7$ — Simplify.

The Cube Root Symbol

$\sqrt[3]{\ }$ This is the special symbol that means "cube root", it is the ***"radical"*** symbol (used for square roots) with a little three to mean **cube** root.

Lesson 1.6 Square and Cube Roots (Day 1)

Guided Practice

Solve. Show your work.

2 Find the cube root of $\frac{1}{729}$.

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Guided Practice

Solve. Show your work.

2 Find the cube root of $\frac{1}{729}$.

$\sqrt[3]{\frac{1}{729}} = \underline{?}\ \sqrt[3]{\left(\frac{1}{9}\right)^3}$

$= \underline{?}\ \frac{1}{9}$

Lesson 1.6 Square and Cube Roots (Day 1)

Solve an equation involving a variable that is squared or cubed.

Example

Solve each equation.

a) $x^2 = 4.41$

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Solve an equation involving a variable that is squared or cubed.

Example

Solve each equation.

a) $x^2 = 4.41$

Solution

Since $4 = 2^2$, use a guess-and-check strategy to find the square root of 4.41, starting with 2.1, 2.2, and so on.

$x^2 = 4.41$

$x^2 = 2.1^2$ or $(-2.1)^2$ $\quad 4.41 = 2.1 \cdot 2.1$ and $4.41 = (-2.1) \cdot (-2.1)$.

$x = 2.1$ or -2.1 $\quad$ Show both the positive and negative square roots.

Lesson 1.6 Square and Cube Roots (Day 1)

Solve an equation involving a variable that is squared or cubed.

Example

b) $x^3 = 1{,}000$

Lesson 1.6 Square and Cube Roots (Day 1)

Solve an equation involving a variable that is squared or cubed.

Example

b) $x^3 = 1{,}000$

Solution

$x^3 = 1{,}000$

$x^3 = 10^3$

$\sqrt[3]{x^3} = \sqrt[3]{10^3}$ Solve for x by taking the cube root of both sides.

$x = 10$ Show the cube root.

Lesson 1.6 Square and Cube Roots (Day 1)

Guided Practice

Solve. Show your work.

3 $x^2 = 2.25$

Lesson 1.6 Square and Cube Roots (Day 1)

Guided Practice

Solve. Show your work.

3 $x^2 = 2.25$

$x^2 = 2.25$

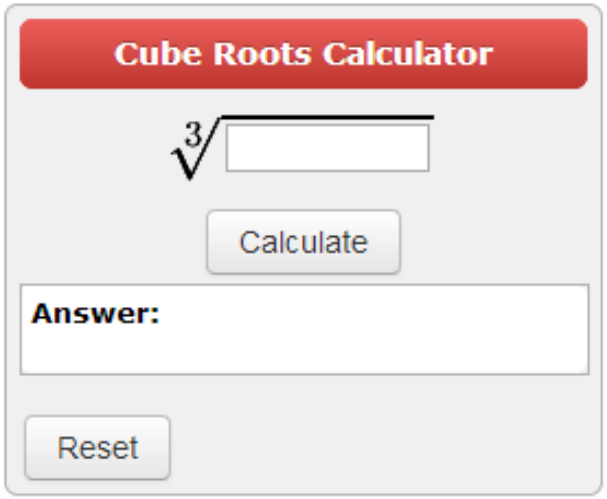
$x^2 =$? or ? $1.5^2; (-1.5)^2$ $2.25 =$? $\cdot$? or (?) $\cdot$ (?) 1.5; 1.5; −1.5; −1.5

$x =$? or ? Show both the ? and ? roots. 1.5; −1.5; positive; negative square

Lesson 1.6 Square and Cube Roots (Day 1)

Solve. Show your work.

4  $x^3 = \frac{1}{8}$



http://www.calculatorsoup.com/calculators/algebra/cuberoots.php

Lesson 1.6 Square and Cube Roots (Day 1)

Solve. Show your work.

4 $x^3 = \frac{1}{8}$

$x^3 = \frac{1}{8}$

$x^3 = \underline{?}$ $\left(\frac{1}{2}\right)^3$

$\underline{?} = \underline{?}$

$x = \underline{?}$

Solve for x by taking the $\underline{?}$ root of both sides. $\sqrt[3]{x^3}$; $\sqrt[3]{\left(\frac{1}{2}\right)^3}$; cube

Show the $\underline{?}$ root. $\frac{1}{2}$; cube

Lesson 1.6 Square and Cube Roots

Independent Practice #1-8

Name:_____ Date:_____

Tuesday Homework

Practice 1.6

Find the two square roots of each number. Round your answer to the nearest tenth when you can.

1. 25
2. 64
3. 80
4. 120

Lesson Check #1 Can evaluate the two square roots of a number, one positive and one negative