Name: ______________________________ Date: _____________

It's Hip to Be Square

8.EE.A.2. Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.

Vocabulary Term	Definition
Square Root	
Factor	
Perfect Square	
Integer	
Radical	
Inverse	
Cube Root	
Prime Factorization	

What do you know about squares:

On the graph paper, draw the smallest possible square. What are the dimensions?

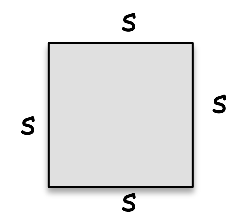
On the graph paper, draw the second largest square. What are the dimensions?

How many squares must be added to the second largest to make another perfect square? Draw it here.

What is the relationship between the side lengths and the area of the square?

Explore It:

The length of each side of a square measures *s* inches long. The area of the square is 49 in^2. What is the length of one side of the square?



Use the math you know to answer the following:

a. Describe in words how to find the area of the square given that each side is *s* inches long.

b. Write a multiplication expression using the variable *s* to represent the area of the square.

c. Write an expression using the variables *s* and an exponent to represent the area of the square:

d. Write an equation setting your expression equal to the area of the square given in the problem:

Using your Geo Board make the first 10 perfect squares. Then fill in the table with your findings.

Square	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
# of squares (area)															
Length															
Width															

Now, look at the equation you wrote on the previous page, $s^2 = 49$. How do you solve an equation where a variable squared is equal to a perfect square?

- You have solved equations before by using ________________ operations.
- You solved addition equations by _________________.
- You solved division equations by __________________.

So, what is the inverse operation of squaring a number? ____________________________

A square root of a number is any number that you can multiply by ________ to get your original number.

For example: 3 is a ____________ of 9, because $3 \cdot 3 = 9$. Another square root of 9 is -3, because $(-3) \cdot (-3) = 9$.

The symbol $\sqrt{\ }$ means positive square root. So, ________________________

Finish the table of perfect squares:

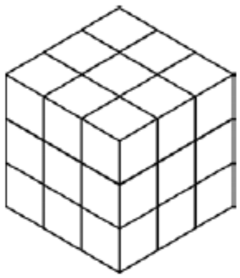
If........	Equals	Then.......	Is......
$4^2 =$		$\pm\sqrt{\ }$	
$5^2 =$		$\pm\sqrt{\ }$	
$6^2 =$		$\pm\sqrt{\ }$	
$7^2 =$		$\pm\sqrt{\ }$	
$8^2 =$		$\pm\sqrt{\ }$	
$9^2 =$		$\pm\sqrt{\ }$	
$10^2 =$		$\pm\sqrt{\ }$	
$11^2 =$		$\pm\sqrt{\ }$	
$12^2 =$		$\pm\sqrt{\ }$	
$13^2 =$		$\pm\sqrt{\ }$	
$14^2 =$		$\pm\sqrt{\ }$	
$15^2 =$		$\pm\sqrt{\ }$	

Reflect:

What is the difference between dividing 16 by 2 and finding the square roots of 16?

Cube It

Cubes have roots have too. Look at the picture below and answer the questions.



How long is each side of the cube?

Label the cube

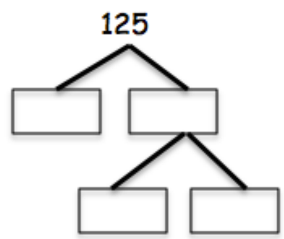
How many cubes are there total?

Solve it: each edge of a cube measure *a* feet long. The volume of the cube is 125 ft^3. What is the measure of each edge of the cube?

1. Picture it (draw and label the cube):

2. You can apply the formula for the volume of a cube, which is ____________________.

3. Complete the prime factorization of 125.



4. Write 125 as the product of three factors. ___________________________________.

5. Write 125 as a power of base 5. ____.

6. What does 125 have in common with a^3 when 125 is written as a power?____________.

So, the product of an integer used as a factor three times is a _______________. Finding the cube root is the _____________ of cubing a number. The cube root of a number is the number that is used as a factor ________ times to produce the original number. The symbol $\sqrt[3]{\ }$ means find the cube root.

7. Use the equation:
the equation shows a variable cubed equal to a perfect cube. Use the cube root to complete the solution.

$a^3 = 125$

$\sqrt[3]{a^3} = \sqrt[3]{}$

$\sqrt[3]{a^3} = \sqrt[3]{}$

___ = ___

Solution: Each edge of the cube is _____ feet long.

So........

If........	Equals	Then.......	Is......
$1^3 =$		$\sqrt[3]{}$	
$2^3 =$		$\sqrt[3]{}$	
$3^3 =$		$\sqrt[3]{}$	
$4^3 =$		$\sqrt[3]{}$	
$5^3 =$		$\sqrt[3]{}$	

Now complete the cube root table up to 10^3.

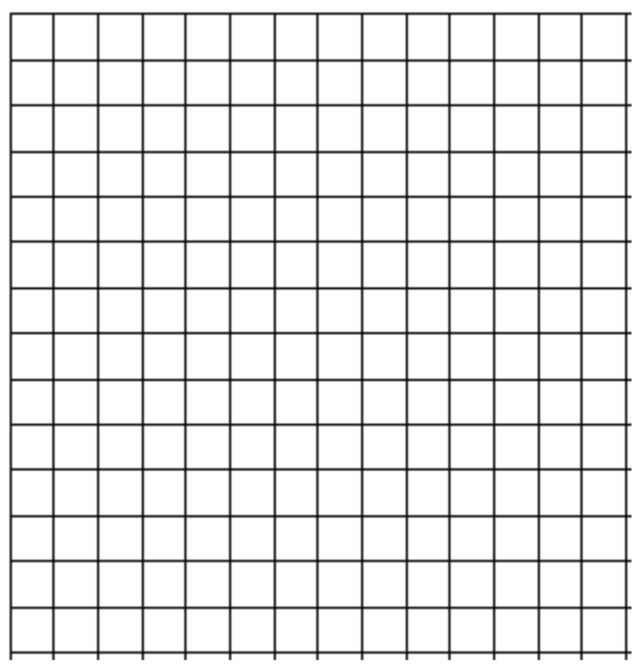
If........	Equals	Then.......	Is......
$6^3 =$		$\sqrt[3]{}$	
$7^3 =$		$\sqrt[3]{}$	
$8^3 =$		$\sqrt[3]{}$	
$9^3 =$		$\sqrt[3]{}$	
$10^3 =$		$\sqrt[3]{}$	

Approximating Square Roots

a. Make a square with an area of 20.

b. About how long is each side of the square? Why isn't it a whole number?

c. What is a better way to "approximate" what a square root is of a number that is not a perfect square.



Between a Whole number and a ………Whole number

We can approximate what two whole numbers a square root will lie between by using what we know about perfect squares.

1	$\sqrt{1}$
2	$\sqrt{4}$
3	$\sqrt{9}$
4	$\sqrt{16}$
5	$\sqrt{25}$
6	$\sqrt{36}$
7	$\sqrt{49}$
8	$\sqrt{64}$
9	$\sqrt{81}$
10	$\sqrt{100}$
11	$\sqrt{121}$
12	$\sqrt{144}$

We can find where a number lies in the list of ____________________ square to say which two whole numbers that square root will be.

For example, 50 is not a perfect square so $\sqrt{50}$ will not be a whole number.

Between which two square roots does it lie?

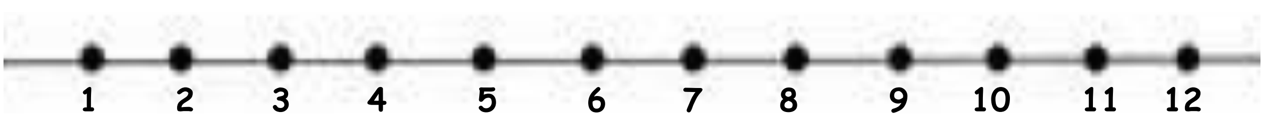
Between $\sqrt{49}$ and $\sqrt{64}$ so we can say that:

The square root of 50 is between 7 and 8.

So……….

Between which two whole numbers do these square roots lie?				
$\sqrt{30}$	$\sqrt{109}$	$\sqrt{40.5}$	$\sqrt{3}$	$\sqrt{68}$

Now: Plot the following square root and cube root on the number line.



a. $\sqrt{60}$

b. $\sqrt{5}$

c. $\sqrt{75}$

d. $\sqrt{110}$

e. $\sqrt{18}$

f. $\sqrt[3]{99}$

g. $\sqrt[3]{36}$

h. $\sqrt[3]{140}$

i. $\sqrt[3]{800}$