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Take out your multiplication chart

Get ready for radicals!

Day 1: Estimating Square Roots

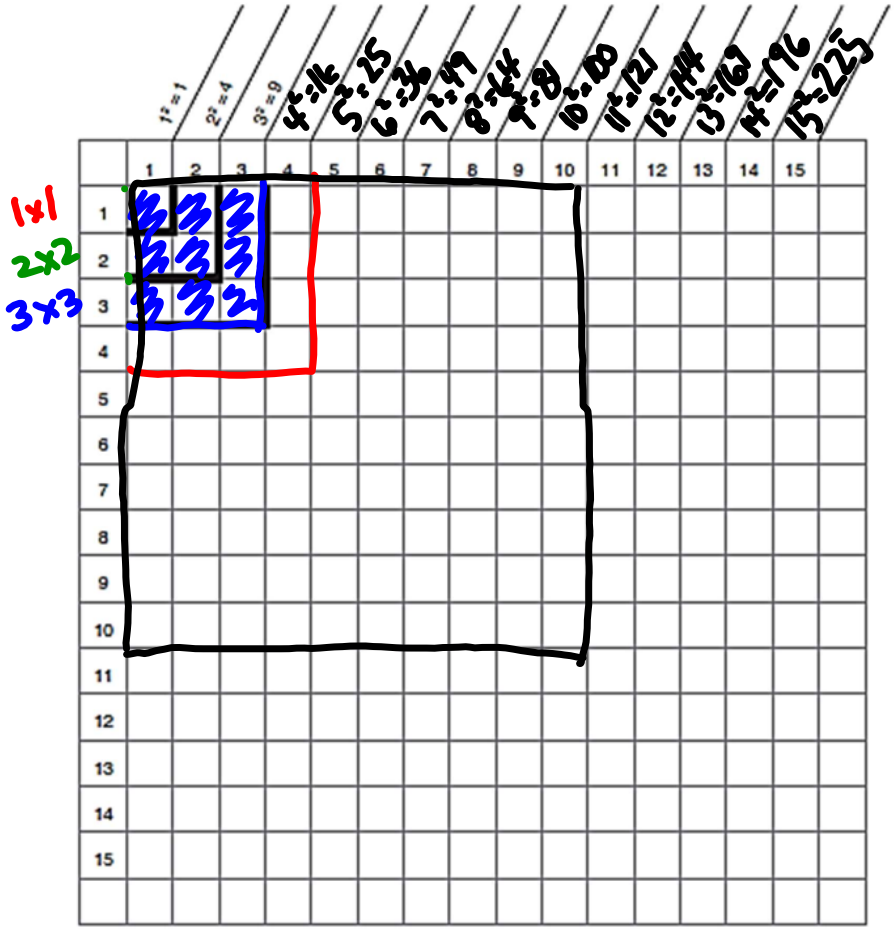
What does it mean to **SQUARE** a number? multiply a # by itself

List three number examples of you squaring a number:

$3^2 = 3 \cdot 3$ $4^2 = 4 \cdot 4$ $5^2 = 5 \cdot 5$

Square Root Grid

Complete the grid by continuing to create squares with side lengths 4 through 15.



Square Root Table

Complete the table below.

	1	2	3	4	5	6	7	8	9	10	x
Square each of the following numbers. Show what squaring a number really means	1^2 (1·1)	2^2 (2·2)	3^2 (3·3)	4^2	5^2	6^2	7^2	8^2	9^2	10^2	x^2 (x·x)
Perfect Squares	1	4	9	16	25	36	49	64	81	100	x^2
Take the square root of each of your perfect squares.	$\sqrt{1}$	$\sqrt{4}$	$\sqrt{9}$	$\sqrt{16}$	$\sqrt{25}$	$\sqrt{36}$	$\sqrt{49}$	$\sqrt{64}$	$\sqrt{81}$	$\sqrt{100}$	$\sqrt{x^2}$
Square Roots	1	2	3	4	5	6	7	8	9	10	x

Perfect Squares are the product of a number multiplied by itself ($4 \cdot 4 = 16$; 16 is the perfect square).

Think about the process we just performed: **Number → Squared It → Took Square Root → Same Number**

A root and an exponent are **inverses** of each other (they undo each other). Therefore, square roots and squaring a number are **inverses** of they undo each other, just like adding and subtracting undo each other.

inverse
+ → −
× → ÷
x^2 → $\sqrt{\ }$

Practice: Answer the following.

a. $\sqrt{25}$ 5

b. $\sqrt{49}$ 7

c. $\sqrt{100}$ 10

d. $\sqrt{18}$ $\sqrt{18}$ → $\sqrt{2 \cdot 9}$ → $3\sqrt{2}$ = $\sqrt{2 \cdot 3 \cdot 3}$ → $3\sqrt{2}$

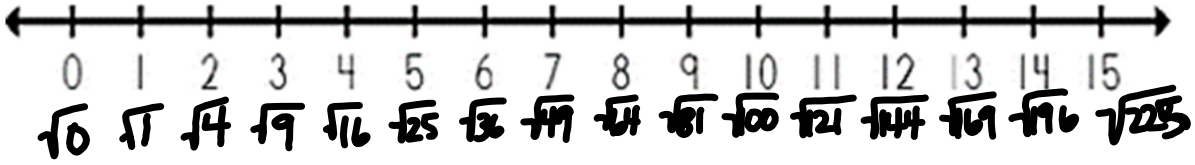
e. $\sqrt{63}$ $\sqrt{3 \cdot 3 \cdot 7}$ → $3\sqrt{7}$

Foundations of Algebra Unit 2: Complex Number Systems Notes

Estimating Square Roots to the Nearest Whole Number

The square root of most numbers is not an integer. How can we use our knowledge of square roots and perfect squares to estimate the value of a square root without using a calculator?

Using the number line below, square each of the following numbers and write their product underneath each number.



On the previous page, we ran into an issue because $\sqrt{18}$ and $\sqrt{63}$ were not perfect squares

Using my number line, I can see that $\sqrt{18}$ is between which two whole numbers? What about $\sqrt{63}$?

$\sqrt{16} < \sqrt{18} < \sqrt{25}$ ≈ 4.2 $\sqrt{49} < \sqrt{63} < \sqrt{64}$ ≈ 7.9

$4 < \sqrt{18} < 5$ $7 < \sqrt{63} < 8$

Practice: Tell which two square roots, followed by which two whole numbers the following square roots are between:

a. $\sqrt{4} < \sqrt{8} < \sqrt{9}$

$2 < \sqrt{8} < 3$

Closer to 3

b. $\sqrt{36} < \sqrt{45} < \sqrt{49}$

$6 < \sqrt{45} < 7$

Closer to 7

c. $\sqrt{81} < \sqrt{91} < \sqrt{100}$

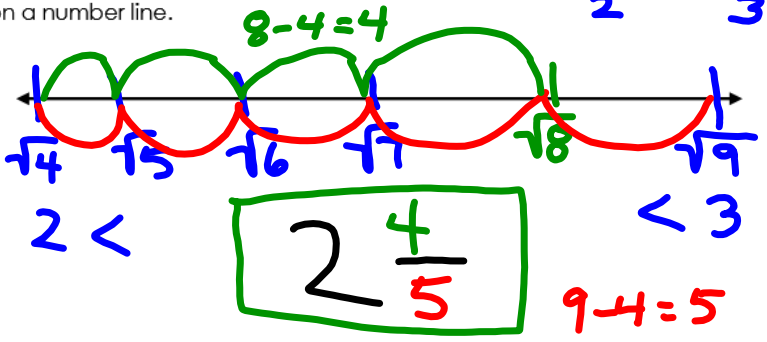
$9 < \sqrt{91} < 10$

Closer to 10

You were able to determine what two whole numbers each of the square roots were between, but how can we be even more accurate without a calculator?

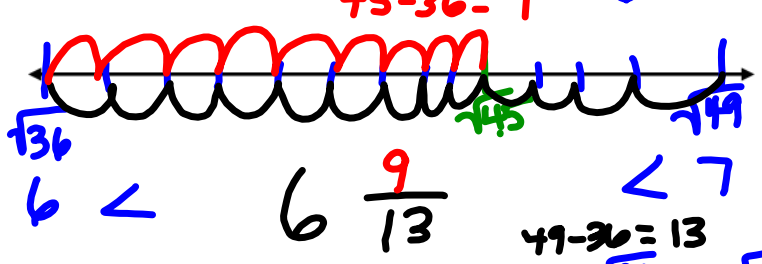
Estimating Square Roots More Accurately

a. Let's look at the $\sqrt{8}$, which was located between $\sqrt{4}$ (2) & $\sqrt{9}$ (3)? Let's put those two square roots on a number line.

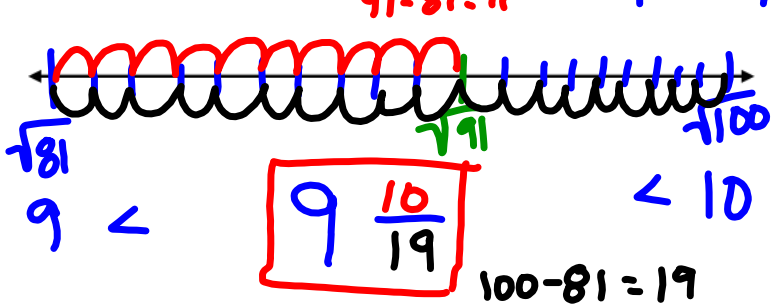


Foundations of Algebra Unit 2: Complex Number Systems Notes

b. Let's look at the $\sqrt{45}$, which was located between $\sqrt{36}$ & $\sqrt{49}$? Let's put those two square roots on a number line.

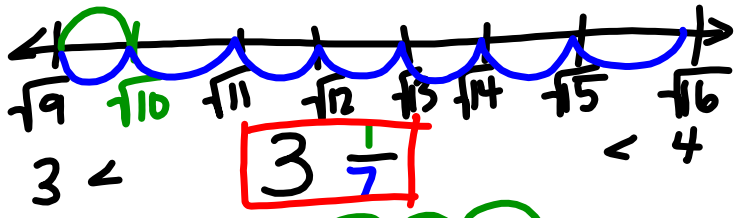


c. Let's look at the $\sqrt{91}$, which was located between $\sqrt{81}$ & $\sqrt{100}$? Let's put those two square roots on a number line.

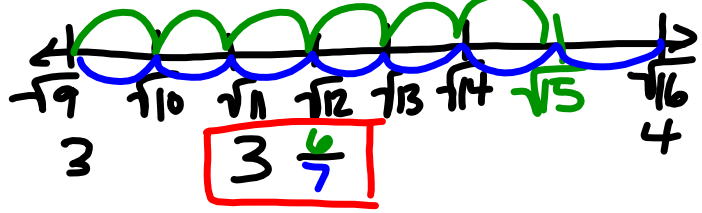


Practice: Calculate the square root of each number using the number line method.

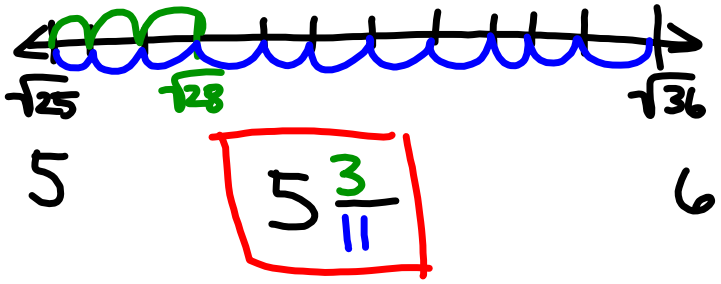
a. $\sqrt{10}$



b. $\sqrt{15}$



c. $\sqrt{28}$



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