NAME:_____ Math _____, Period _____

Mr. Rogove Date:_____

Learning Objective: We will use rational approximation to get a more accurate decimal expansion of irrational numbers. (G8M7L8)

Concept Development:

Irrational Numbers: Numbers that have infinite decimal expansions **and DO NOT** have repeating block of digits.

Example: $\sqrt{3}, \sqrt{22}$ *Non-Example:* $\frac{5}{3}$, $\sqrt{12.25}$

Using Rational Approximation to Get the Decimal Expansion of Square Roots

Rational approximation uses a sequence of rational numbers to get closer and closer to a given number to estimate the value of the number.

-Begin by determining the integers that the square root lies between.

-Then determine which interval of tenths that the number belongs.

-Then determine which interval of hundredths the number belongs.

We can use rational approximation to compare irrational numbers

Example: Which number is greater: $\sqrt{65}$ *or* $\frac{89}{11}$?

$8\frac{1}{11}$

$\approx 8\frac{1}{17}$ $\sqrt{65} < 8.\overline{09}$

$8 < \sqrt{65} < 9$

$8 < \sqrt{65} < 8.1$ 8.1

$\sqrt{64} < \sqrt{65} < \sqrt{65.61}$ 8.1 / 65.61

$(8.05)^2 =$ ≈ 8.06

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Guided Practice:

Steps to Finding the Values of Square Roots

1. Determine which two integers the square root is between.
2. Use rational approximation to determine which interval of tenths the number falls between.
3. Use rational approximation to determine which interval of hundredths the number falls between.
4. If necessary make the requested comparison.

Estimate the value of $\sqrt{28}$ to the nearest hundredth.

$\sqrt{25} < \sqrt{28} < \sqrt{36}$

$5 < \sqrt{28} < 6$

$\sqrt{27.04} < \sqrt{28} < \sqrt{28.09}$

$5.2 < \sqrt{28} < 5.3$

$\sqrt{27.9841} < \sqrt{28} < \sqrt{28.09}$

5.29 5.30

5.3 × 5.3 = 28.09; 5.2 × 5.2 = 27.04; 5.29 × 5.29 = 27.9841

$\sqrt{28}$ is approximately 5.29

Estimate the value of $\sqrt{17}$ to the nearest hundredth.

$\sqrt{16} < \sqrt{17} < \sqrt{25}$

$4 < \sqrt{17} < 5$

$\sqrt{16.81} < \sqrt{17} < \sqrt{17.64}$

$4.1 < \sqrt{17} < 4.2$

$(4.13)^2$ = 17.0569

$\sqrt{16.9744} < \sqrt{17} < \sqrt{17.0569}$

$4.12 < \sqrt{17} < 4.13$

4.1 × 4.1 = 16.81; 4.2 × 4.2 = 17.64

$\sqrt{17} \approx 4.12$

Estimate the value of $\sqrt{91}$ to the nearest hundredth.

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

$9 < \sqrt{91} < 10$

$\sqrt{90.25} < \sqrt{91} < \sqrt{92.16}$

$9.5 < \sqrt{91} < 9.6$

$\sqrt{90.8209} < \sqrt{91} < \sqrt{91.0116}$

$9.53 < \sqrt{91} < 9.54$

9.54 × 9.54 = 91.0116; 9.5 × 9.5 = 90.25

$\sqrt{91}$ is approximately 9.54

Estimate the value of $\sqrt{78}$ to the nearest hundredth.

$8 < \sqrt{78} < 9$

$\sqrt{64} < \sqrt{78} < \sqrt{81}$

$\sqrt{77.44} < \sqrt{78} < \sqrt{79.21}$

$(8.8)^2 = 77.44$

$8.8 < \sqrt{78} < 8.9$

$(8.9)^2 = 79.21$

$\sqrt{77.9689} < \sqrt{78} < \sqrt{78.1456}$

8.83 <

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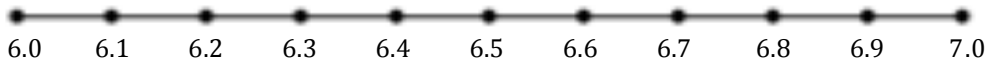
Which is greater, $\sqrt{50}$ *or* $\frac{319}{45}$?	Which is greater, $\sqrt{59}$ *or* $\frac{253}{33}$?

Place the following on a number line:

$$\sqrt{38}\ ,\sqrt{43}\ ,\sqrt{47}\ ,\frac{20}{3}\ ,6.\overline{15}\ ,\frac{53}{8}$$



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Independent Practice:

Estimate the value of $\sqrt{22}$ to the nearest hundredth.	Estimate the value of $\sqrt{63}$ to the nearest hundredth.
Which is greater, $\sqrt{72}$ *or* $8.\overline{4}$?	Which is greater, $\sqrt{14}$ *or* $\frac{15}{4}$?

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Activating Prior Knowledge:

We can divide fractions using long division:

$\frac{4}{11}$ $\cdot 3\overline{6}$ $11\overline{)4.0}$ 33 70 66 40	$\frac{5}{12}$ $.41\overline{6}$

Closure:

Describe at least three ways to approximate $\sqrt{108}$

or Approximate $\sqrt[3]{25}$

Notes:

Lesson 11 and 13?
Homework should be lesson 13 Problem set. No calculator PLEASE!!!