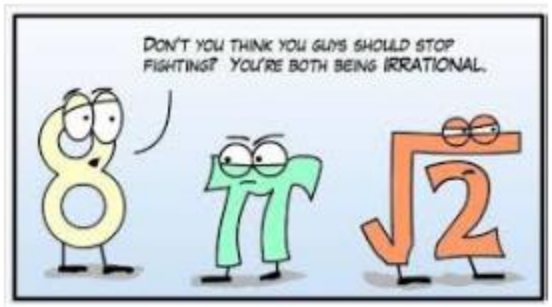
The Real Number System and Pythagorean Theorem
Unit 9 Part A



Standards:

8.NS.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

8.NS.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions.

8.EE.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 $\sqrt{2}$ is irrational.

8.G.6 Explain a proof of the Pythagorean Theorem and its converse.

8.G.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

8.G.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Name:________________________________ **Date:** _____________ **Period:**______

Lesson #85 Finite and Infinite Decimals

Use long division to determine the decimal expansion of each of the following number, without the use of a calculator.

1. $\frac{54}{20}$

2. $\frac{7}{8}$

3. $\frac{8}{9}$

4. $\frac{22}{7}$

5. What do you notice about the decimal expansions of Exercises 1 and 2 compared to the decimal expansions of Exercises 3 and 4?

A __________________ is a decimal that terminates, while an _____________________ is one that repeats.

6. Convert the fraction $\frac{7}{8}$ to a decimal using the following process.

1. Write the denominator as a product of 2's or 5's. $\frac{7}{8} = \frac{7}{2^3}$

2. Multiply the numerator and denominator by a common multiple that will make the denominator a power of ten. $\frac{7}{2^3} \cdot \frac{5^3}{5^3} = \frac{7 \cdot 5^3}{10^3}$

3. Change to a decimal. $\frac{875}{1000} = 0.875$

Use a similar process as above to convert the following fractions to finite decimals.

7. $\frac{7}{16}$

8. $\frac{9}{25}$

9. $\frac{3}{32}$

10. $\frac{11}{125}$

11. $\frac{1}{40}$

12. $\frac{9}{200}$

HW #85 Finite and Infinite Decimals

State whether the decimal is finite or infinite by determining if the denominator can be changed to a product of 5's or 2's. If it can, rewrite it as a finite decimal using the process of changing the denominator to a power of 10. If not, state that it is infinite.

1. $\frac{2}{32}$

2. $\frac{3}{28}$

3. $\frac{8}{15}$

4. $\frac{13}{125}$

5. $\frac{15}{35}$

6. $\frac{33}{250}$

Lesson #86 Converting Repeating Decimals to Fractions

Numbers with decimal expansions that repeat are rational numbers and can be converted to fractions using an _________________________.

Example: Find the fraction that is equal to the number $0.\overline{567}$.

Let x represent the infinite decimal $0.\overline{567}$.

$\boldsymbol{x = 0.\overline{567}}$	
$\boldsymbol{10^3 x = 10^3(0.\overline{567})}$	Multiply by $\boldsymbol{10^3}$ because there are $\boldsymbol{3}$ digits that repeat
$\boldsymbol{1000x = 567.\overline{567}}$	Simplify
$\boldsymbol{1000x = 567 + 0.\overline{567}}$	By addition
$\boldsymbol{1000x = 567 + x}$	By substitution; $\boldsymbol{x = 0.\overline{567}}$
$\boldsymbol{1000x - x = 567 + x - x}$	Subtraction Property of Equality
$\boldsymbol{999x = 567}$	Simplify
$\boldsymbol{\frac{999}{999}x = \frac{567}{999}}$	Division Property of Equality
$\boldsymbol{x = \frac{567}{999} = \frac{63}{111}}$	Simplify

This process may need to be used more than once when the repeating digits do not begin ______________________________________ for numbers such as $1.2\overline{6}$, for example.

__________________________________ are numbers that are not rational. They have infinite decimals that do not repeat and cannot be represented as a _________________________.

Find the fractional representation of each of the following numbers:

1. $0.\overline{4}$

2. $0.\overline{18}$

3. $0.\overline{09}$

4. $0.\overline{123}$

5. $0.1\overline{6}$

6. $0.8\overline{3}$

7. $\mathbf{0.4\overline{56}}$

8. $\mathbf{0.21\overline{7}}$

HW #86 Converting Repeating Decimals to Fractions

Find the fractional representation of each of the following numbers:

1. $0.\overline{5}$

2. $0.\overline{81}$

3. $0.\overline{60}$

4. $0.\overline{456}$

5. What do you notice about all of the denominators of the fractions you found above? What conclusions can you make as a result?

Lesson #87 The Real Number System

Definitions:

Real Numbers - ____________________________.

Rational Numbers (Q) - Numbers that can be _________________________________.

Irrational Numbers (I) - Numbers that ____; non-repeating, non-terminating decimals.

Natural Numbers (N) - The counting numbers ______________________.

Whole Numbers (W) - The set of natural numbers and 0 ______________________.

Integers (Z) - The set of whole numbers and their opposites _____________________.

When the square root of a number results in a _____________________________, it is

__________________________. If the square root of a number ____________________

__________________________ it is ___________________________.

Determine the square root of each, round to the nearest tenth when necessary. Circle the rational numbers.

1. $-\sqrt{25}$

2. $\sqrt{121}$

3. $\sqrt{90}$

4. $-\sqrt{12}$

5. $\sqrt{400}$

6. $-\sqrt{54}$

7. $\sqrt{289}$

8. $-\sqrt{300}$

9. $-\sqrt{576}$

Graphic Organizer:

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________________________ ________________________

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Use the graphic organizer above to determine all the sets each number belongs to.

1. -6
2. $8\frac{2}{5}$
3. π
4. $\sqrt{2}$
5. $5.\overline{3}$
6. 0.05
7. -2.6
8. -8.12121212…
9. 0.010010001…
10. $-\sqrt{36}$
11. 3.256256256….
12. $\sqrt{99}$

What is the difference between rational and irrational? ________________________

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HW #87 Real Numbers

State which number sets each of the following numbers belongs to.

1. 12

2. $-4\frac{1}{2}$

3. 3.14

4. $\sqrt{3}$

5. $10.\overline{6}$

6. 0.009

7. -4

8. -1.166666666…

9. 0.020020002…

10. $-\sqrt{64}$