Goals: To discuss division with decimals

* Rational Numbers and Irrational numbers
	+ Terminating and repeating decimals vs non repeating not terminating decimals
* Converting fractions to decimals
* Converting decimals to fractions
	+ Terminating decimals to fractions
	+ Repeating decimals to fractions
* Problems involving fractions and decimals together.

# Rational Numbers and Irrational Numbers

The set of numbers we call the Real Numbers, consist of the union of the sets of both the Rational Numbers, fractions, and their compliment the Irrationals. Using a Venn Diagram, it looks like this:



These two sets the Rational Numbers and the Irrational numbers have VERY distinct decimal representations that are their “Calling Cards” for their membership in each set.

Click [here](https://youtu.be/IK0OR2vg_Qc) to see a video of explaining this.

They are as follows:

Every Irrational Number will have a decimal representation that will simply:

 **Never terminate**

 **& Never Repeat!!!**

Examples:

Every Rational Number will have a decimal representation in one of two forms:

**1. A terminating decimal**

(in reduced form, the denominator always has a prime factorization of only 2’s and/or 5’s)

Examples:

**2. A non-terminating decimal, BUT it repeats after some point**.

(denominator has prime factors other than just 2’s and 5’s)

Examples:

This is the real numbers all mixed together on the real number line.

# Converting Fractions to Decimals

To convert a fraction into a decimal you only have to recognize that fractions are simply little division problems! So…divide!!

Examples:

# Converting decimals to fractions

Not all decimals are fractions, like 3.14159265359….

So only the terminating and the repeating (non-terminating) decimals are able to be expressed as fractions.

## Converting terminating decimals into fractions

 If you say the proper name of the decimal, you can write it in its fraction or mixed fraction form and thereby express it as a mixed fraction.

Examples: Notice, that these decimals will always have a denominator consisting of only 2’s and/or 5’s.

0.5 0.6 0.123 0.9547 5.569 63.851

## Converting non-terminating but repeating decimals into fractions (skip if you dare)

This is not your buddies section, this is for those of us that care enough to learn something new.

This is not always easy, it requires us to remember that denominators of numbers consisting of primes other than 2’s and 5’s will always make a decimal repeat, and that 9’s in the denominator are one way to make a number repeat.

Consider: Notice the patterns with denominators containing 9’s. Check your fractions with a calculator to be sure they are equal to these decimals.

But what about decimals like these:

Recall: and

Challenge problems:

# Problems Involving Fractions and Decimals Together

Fractions and terminating or repeating decimals are different formats for expressing the same thing.

If you have a problem that has two rational numbers but in different forms, you can pick which form you wish to work with, fraction form or decimal form. Some ways may seem easier than other ways so choose based on the problem.

Examples: