Lesson 7.3 (F'11)

Objectives: 1. To convert fractions to decimals that repeat and repeating decimals to fractions.

Any **rational number** can be expressed as a decimal that must either terminating or repeating.

Remember from Section 7.1

Given the rational number $\frac{a}{b}$, in <u>simplest form</u> (reduced), if the prime factorization of b contains only ____'s and/or ____'s then $\frac{a}{b}$ can be written as a __________ decimal.

If the prime factorization of b contains factors other than ___'s and/or ___'s then $\frac{a}{b}$ can be written as a ___ decimal.

Consider $\frac{9}{40}$ Does it terminate? _____

Let's change it to a decimal. Consider two different ways.

<u>Method 1: Make denominator a power of 10</u> <u>Method 2: Division</u>

Try this---Change $\frac{3}{20}$ by making the denominator a power of 10 and using division

Repeating decimals

Find the decimal for each fraction.

1. $\frac{3}{7}$

2. $\frac{4}{9}$

3. $\frac{5}{11}$

4. $\frac{22}{45}$

The above problems are examples of a ***repeating decimals***, and the repeating block of digits is called the ***repetend.*** We use a bar to indicate that the block of digits underneath is repeated continuously.

EXAMPLES: Change each of the following to a decimal using long division without a calculator.

$\frac{5}{6}$

$\frac{3}{8}$

$\frac{5}{11}$

$\frac{1}{7}$

As we went through the division process in the last example $\frac{1}{7}$, we obtained remainders of 3, 2, 6, 4, 5, and 1. These are ***all the*** possible nonzero remainders when dividing by 7– that is 6 possible remainders. (If we got a 0, it would have terminated.). Since each of the possible remainders had occurred, at this point, one of the possible remainders ***must*** reoccur in the next subtraction. This is where the repetend for $\frac{1}{7}$ must begin again (if not before) and it did!

In general, if $\frac{a}{b}$ is any rational number in simplest form and does not terminate, the repetend will have at most __________ digits.

You Try-- a. $\frac{2}{13}$ b. $\frac{3}{22}$

Repeating decimal as a fraction

We know that 0.48 = =

But when we have a repeating decimal we have infinitely many digits, so there is no single power of 10 that can be place in the denominator. To overcome this difficulty, we must somehow eliminate the *infinitely repeating* part of the decimal by multiplying by a power of 10 *and use a little bit of algebra*.

1. $0.\overline{6}$

2. $0.\overline{72}$

2. $0.\overline{876}$

4. $3.2\overline{45}$

Try These: Use the above formula to find the fraction for the following repeating decimals.

1. $0.\overline{7}$ 2. $0.\overline{62}$ 3. $0.\overline{9}$

Ordering repeating decimals

Line up the numbers vertically with decimal points aligned. Extend the repetend out a few times. Compare.

Compare $1.\overline{4578}$, $1.4\overline{578}$, $1.45\overline{78}$

1.	4	5	7	8	4	5	7	8	4	5	7…
1.	4	5	7	8	5	7	8	5	7	8	5…
1.	4	5	7	8	7	8	7	8	7	8	7

Try This: Compare $3.\overline{876}$ and $3.8\overline{7}$

DENSENESS PROPERTY OF DECIMALS

Between any two rational numbers there are infinitely many rational numbers.

Find three rational numbers between $0.\overline{69}$ and $0.\overline{691}$

Activity WORKSHEET

Homework Course Compass Section 7.3 and page #A 1e, 1h, 5, 13, 19, page 448 #B 2e, 4, 11