Lesson 14: Converting Rational Numbers to Decimals Using Long Division

Classwork

Example 1: Can All Rational Numbers Be Written as Decimals?

a. Using the division button on your calculator, explore various quotients of integers 1 through 11. Record your fraction representations and their corresponding decimal representations in the space below.

b. What two types of decimals do you see?

Example 2: Decimal Representations of Rational Numbers

In the chart below, organize the fractions and their corresponding decimal representation listed in Example 1 according to their type of decimal.

What do these fractions have in common?	What do these fractions have in common?

Example 3: Converting Rational Numbers to Decimals Using Long Division

Use the long division algorithm to find the decimal value of $-\frac{3}{4}$.

Exercise 1

Students convert each rational number to its decimal form using long division.

a. $-\frac{7}{8} =$

b. $\frac{3}{16} =$

Example 4: Converting Rational Numbers to Decimals Using Long Division

Use long division to find the decimal representation of $\frac{1}{3}$.

Exercise 2

Calculate the decimal values of the fraction below using long division. Express your answers using bars over the shortest sequence of repeating digits.

a. $-\frac{4}{9}$

b. $-\frac{1}{11}$

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

d. $-\frac{5}{6}$

Example 5: Fractions Represent Terminating or Repeating Decimals

How do we determine whether the decimal representation of a quotient of two integers, with the divisor not equal to zero, will terminate or repeat?

Example 6: Using Rational Number Conversions in Problem Solving

a. Eric and four of his friends are taking a trip across the New York State Thruway. They decide to split the cost of tolls equally. If the total cost of tolls is $\$8$, how much will each person have to pay?

b. Just before leaving on the trip, two of Eric's friends have a family emergency and cannot go. What is each person's share of the $\$8$ tolls now?

Lesson Summary

The real world requires that we represent rational numbers in different ways depending on the context of a situation. All rational numbers can be represented as either terminating decimals or repeating decimals using the long division algorithm. We represent repeating decimals by placing a bar over the shortest sequence of repeating digits.

Problem Set

1. Convert each rational number into its decimal form.

$\frac{1}{9} =$ ________________

$\frac{1}{6} =$ ________________

$\frac{2}{9} =$ ________________

$\frac{1}{3} =$ ________________ $\frac{2}{6} =$ ________________ $\frac{3}{9} =$ ________________

$\frac{4}{9} =$ ________________

$\frac{3}{6} =$ ________________

$\frac{5}{9} =$ ________________

$\frac{2}{3} =$ ________________ $\frac{4}{6} =$ ________________ $\frac{6}{9} =$ ________________

$\frac{7}{9} =$ ________________

$\frac{5}{6} =$ ________________

$\frac{8}{9} =$ ________________

One of these decimal representations is not like the others. Why?

Enrichment:

2. Chandler tells Aubrey that the decimal value of $-\frac{1}{17}$ is not a repeating decimal. Should Aubrey believe him? Explain.

3. Complete the quotients below without using a calculator and answer the questions that follow.

   a. Convert each rational number in the table to its decimal equivalent.

$\frac{1}{11}=$	$\frac{2}{11}=$	$\frac{3}{11}=$	$\frac{4}{11}=$	$\frac{5}{11}=$
$\frac{6}{11}=$	$\frac{7}{11}=$	$\frac{8}{11}=$	$\frac{9}{11}=$	$\frac{10}{11}=$

   Do you see a pattern? Explain.

   b. Convert each rational number in the table to its decimal equivalent.

$\frac{0}{99}=$	$\frac{10}{99}=$	$\frac{20}{99}=$	$\frac{30}{99}=$	$\frac{45}{99}=$
$\frac{58}{99}=$	$\frac{62}{99}=$	$\frac{77}{99}=$	$\frac{81}{99}=$	$\frac{98}{99}=$

   Do you see a pattern? Explain.

   c. Can you find other rational numbers that follow similar patterns?