Rational Numbers

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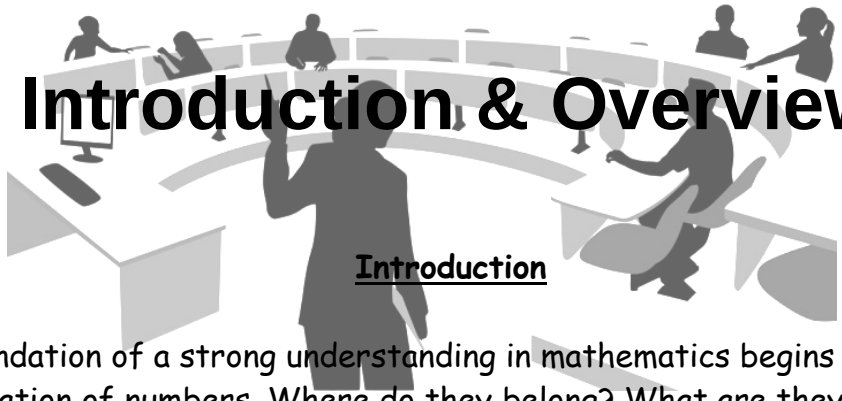


Introduction & Overview

Introduction

The foundation of a strong understanding in mathematics begins and ends with the classification of numbers. Where do they belong? What are they called? Where can I use them? How do they interact with each other? These are some of the many questions we try to answer as we study mathematics.

For most of our lives, since the moment we begin to make sense of the world, we work with rational numbers. There is no way to escape them. Whether we decide to work at the World Trade Center managing billions and trillions, become the next best thing in Nascar, explore other planets, become an athletic trainer, work at the family business, or be a stay-at-home mom or dad, rational numbers will be part of our daily lives. So, what are rational numbers?

Rational numbers are divided into the following classes:

- Natural Numbers
  Natural numbers are also called "counting numbers." These numbers begin with the number 1 and are non-negative and do not have fractions or decimals.

  Natural Numbers: 1, 2, 3, 4, 5,…

- Whole Numbers
  After the idea of "zero" developed, a new class also developed. The class, the whole numbers, are the natural numbers plus the number zero. Although different people define it differently, this is the most consistent definition of whole numbers. If Carlos comes to class without a pencil, how many pencils does he has? Zero.

However, Carlos can go and get one or more pencils.

Whole Numbers: 0, 1, 2, 3, 4,…

- Integers

The word "Integer" is a Latin word which literally means "untouched" or "whole." Integers are formed by combining the whole numbers and negative numbers. Integers, just like natural and whole numbers, do not have fractions or decimals.

Integers: …-3, -2, -1, 0, 1, 2, 3,…

- Rational Numbers

Rational numbers are numbers which can be expressed as the quotient (answer to a division) of two integers, such as $\frac{a}{b}$ $(\frac{5}{6}, \frac{12}{4}, \frac{17}{3}, \ldots)$. The only exception is that the denominator cannot be equal to zero. This would produce an undefined result $(\frac{a}{0} is\ wrong)$.

Rational Numbers: $2, \frac{1}{3}, -\frac{3}{5}, \sqrt{16}$, 13.72

Rational numbers have two rules which are easy to remember:

1. Rational numbers repeat. Such as $(1.333\overline{3})$

and

2. Rational numbers terminate. Such as (4.7)

- Irrational Numbers

Irrational numbers, unlike rational numbers, cannot be express as a fraction such as $\frac{a}{b}$ where a and b are integers and b is a non-zero integer. One of the most famous irrational numbers is Pi (π).

Irrational numbers: π, $\sqrt{2}$, 2.345456534569823…

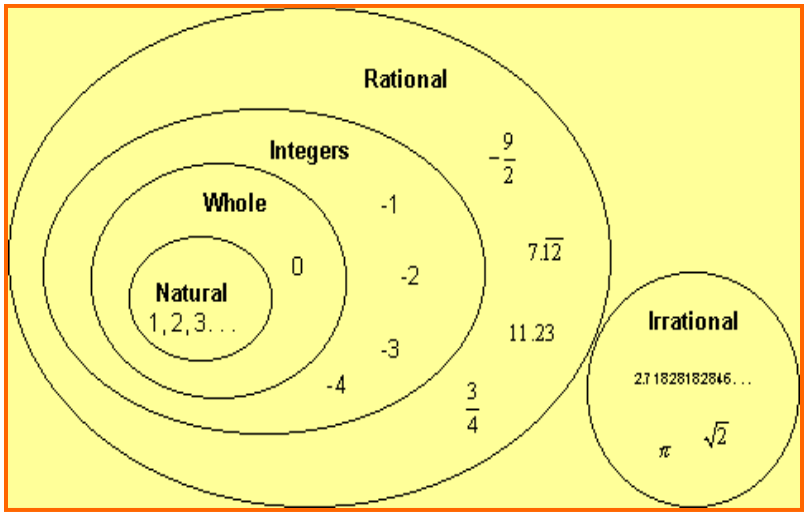
Irrational numbers have two rules which are easy to remember:

1. Irrational numbers NEVER repeat. Such as Pi.

and

2. Irrational numbers NEVER terminate.

The following diagram illustrates the relationship of the sets that make up the real numbers.



Use the graph to help you see the relationship between the different definitions of numbers:

Are natural numbers rational numbers?	Yes they are. Always.
Are rational numbers natural numbers?	Sometimes.
Are whole numbers irrational numbers?	Never.
Are irrational numbers integers?	Never.
Are integers rational numbers?	Sometimes.

Rational numbers and irrational numbers are both considered to be part of the real numbers. In a future lesson, we will also cover imaginary numbers. ☺

Overview

In this unit, we will cover the following topics about rational numbers. This is a simple overview to help you prepare. This unit covers the following topics:

- Comparing Integers
  In this section we will order integers from least to greatest, graph using the number line and compare rational numbers and variables. We will used the <, >, and = signs to compare rational numbers.

- Adding Rational Numbers
  This section covers the addition of rational numbers with the same sign (+ and +), with different signs (+ and -), the addition of several rational numbers and simplifying expressions.

- Subtracting Rational Numbers
  Just as in the addition section, we will learn how to subtract rational numbers with the same sign (+ and +), with different signs (+ and -), and simple expressions with the properties of subtraction.

- Rational Numbers and the Absolute Value
  Understanding rational numbers when dealing with absolute value and the distance from zero will be covered. This will lead into evaluating expressions involving rational numbers.

- Multiplying Rational Numbers
  Finding the product, simplifying expressions, and evaluating expressions with rational numbers will be covered in this lesson.

- Dividing Rational Numbers
  After the previous lessons have been mastered, we will explore the concept of division, finding the quotient of rational numbers, simplifying algebraic expressions, and evaluating algebraic expressions using division.