

Math 9 – Unit 1: Real Numbers

Name: Mr. Hagen

Lesson #1: Rational and Irrational Numbers

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Learning Goal: We are learning to relate rational numbers to decimals, fractions, and integers.

Welcome to the wonderful and beautiful world of Mathematics. Math is a language with its own syntax, grammar, and rules. Also, for Math to be readable and elegant (yes, it can be elegant), it needs to be written in a certain way. It is essential that you learn and adapt to this structure. First, we begin by looking at real numbers.

A **real number** is *any number you can think of*

ex: 73, 17, -29, 182.5, $\pi = 3.14159...$, $\sqrt{9} = 3$, $\sqrt{-9}$

Another set of numbers of interests are **integers**. Integers are *whole numbers, positive or negative.*

↳ imaginary number

Within the real numbers are two different sets (or types) of numbers:

A **rational number** is: *the ratio of two integers, a and b, but $b \neq 0$.*

→ fraction $\frac{a}{b}$

→ you cannot divide by zero.

An **irrational number** is:

a number which cannot be written as a fraction

ex: $\frac{3}{2}$, $\frac{5}{8}$, $\frac{0}{9}$, $\frac{6}{1}$ ←

$\pi = 3.14...$

$\phi = \text{phi} = 1.618...$

Golden Ratio

$e = 2.718...$

State if the following are rational or irrational: *or neither.*

a) $\frac{1}{2}$

R

b) $\frac{-3}{0}$

N

c) $\frac{-0}{4} = 0$

R

d) $\sqrt{5}$

$= 2.236067977...$

Irrational #

e) $\sqrt{-9}$

N

Rational numbers can be represented as fractions or decimals. In decimal form, it can terminate or repeat. A repeating decimal has a period and a length of period. → steps

Write the fraction as a decimal, then state the period and length of period: what's repeating

a) $\frac{2}{3} = 0.6666$
 $= 0.\overline{6}$

Period: 6
 Length of Period: 1

b) $\frac{10}{7} = 1.\overline{428571}$

Period 428571
 Lop = 6

c) $\frac{5}{12} = 0.4\overline{16}$ ↳ how many digits

Period 16
 Lop is 1

$\frac{3}{5} = 0.6$

If the decimal is a terminating decimal, it can be quickly converted to a fraction. (Repeating decimals can be converted, but it can be more complicated and we will not do it here.) The denominator is the place value of the right-most digit. The numerator is the number without the decimal. To finish it off, simplify the fraction to lowest terms.

Write the decimal as a fraction in lowest terms:

a) 0.6
 $= \frac{6 \div 2}{10 \div 2}$
 $= \frac{3}{5}$

b) 1.42
 $= \frac{142 \div 2}{100 \div 2}$
 $= \frac{71}{50}$
 ~~$= 1\frac{21}{50}$~~

c) -0.875
 $= \frac{-875 \div 5}{1000 \div 5}$
 $= \frac{-175 \div 5}{200 \div 5}$
 $= \frac{-35 \div 5}{40 \div 5} = \frac{-7}{8}$

d) -3.25
 $= \frac{-325 \div 25}{100 \div 25}$
 $= \frac{-13}{4}$

Put the following numbers in order from lowest to highest:

$\frac{1}{3}, 0.33, \frac{9}{24}, \sqrt{10}, \frac{3}{10}$

$\frac{1}{9} = 0.1111 = 0.\overline{1}$

$\frac{2}{9} = 0.\overline{2}$

$0.\overline{4} = \frac{4}{9}$

$0.\overline{8} = \frac{8}{9}$

$0.\overline{9} = \frac{9}{9} = 1$

$0.9999 \dots$

Success Criteria:

- I can identify rational and irrational numbers
- I can convert between decimals and fractions
- I can state the period and length of period of a repeating decimal