Math 9 – Unit 1: Real Numbers

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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: 5, $23{,}000$, 13, -8.5, 0, $\pi = 3.14159\ldots$

Another set of numbers of interests are integers. Integers are non decimal numbers. ex: -8, 0, 1, 29000

$\sqrt{-4} = \not{2}$ cannot $\sqrt{}$ negative numbers

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

A rational number is: a number which can be written a the ratio of two integers, a and b, but b cannot be zero.

↳ a fraction $\frac{a}{b}$, $b \neq 0$ ex: $\frac{9}{0}$ = error or undefined.

↳ not real

An irrational number is: a number which cannot be written as a fraction. ex: $\frac{2}{1}$

$\pi = 3.14159\ldots$ goes forever with no pattern to the digits

$\sqrt{2} = 1.41\ldots$ no pattern, keeps going forever.

$\sqrt{9} = 3$ $\sqrt{21} = 4.58\ldots$

State if the following are rational or irrational; or neither

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

b) $\frac{-3}{0}$ neither

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

d) $\sqrt{5} = 2.236\ldots$ irrational

e) $\sqrt{-9}$ = error neither, not real

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.

↳ LoP is how many digits are repeating ↳ what is repeating

Write the fraction as a decimal, then state the period and length of period:

a) $\frac{2}{3}$ $2 \div 3$

$= 0.6666\ldots$

$= 0.\overline{6}$

Period: 6

LoP: 1

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

Period: 428571

LoP: 6

c) $\frac{5}{12} = 0.41\overline{6}$

Period: 6

LoP: 1

d) $\frac{3}{8} = 0.375$

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 (tenths)

$= \frac{6 \div 2}{10 \div 2}$

$= \frac{3}{5}$

b) 1.42 (hundredths)

$= \frac{142 \div 2}{100 \div 2}$

$= \frac{71}{50}$

c) -0.875 (thousandths)

$= \frac{-875 \div 25}{1000 \div 25}$

$= \frac{-175 \div 25}{200 \div 25}$

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

d) -3.25

$= \frac{-325 \div 25}{100 \div 25}$

$= \frac{-13}{4}$

Put the following numbers in order from lowest to highest:

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

put all into decimals

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