Math 9 – Unit 1: Real Numbers

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Lesson #1: Rational and Irrational Numbers

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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 that you can think of

ex: 54, $17\frac{1}{2}$, 17.5, $\pi = 3.14159...$

Another set of numbers ~~of interests~~ are integers. Integers are non decimal numbers

ex: -6, 0, 8, 1000000

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

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

$\frac{a}{b}$ → A rational number is a number that can be written as a fraction

An irrational number is:

a number that cannot be written as a fraction.

ex: $\pi = 3.14159...$

State if the following are rational or irrational:

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

rational

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

neither

→ not a #

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

rational

d) $\sqrt{5}$

= 2.23606.....

irrational

c) $\sqrt{-9}$

cannot square root negatives

$\sqrt{9} = 3$

$3 \times 3 = 9$

$-3 \times -3 = 9$

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.

Write the fraction as a decimal, then state the period and length of period: (the numbers that are repeating)

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

Period: 6

Length of Period: 1

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

Period: 428571

Length: 6

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

Period: 6

Length: 1

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 most right 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

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

$= \frac{-35 \div 5}{40 \div 5}$

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

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

$0.\overline{3}$, 0.33, 0.375, 3.16, 0.3

$0.3, 0.33, 0.\overline{3}, 0.375, 3.16$