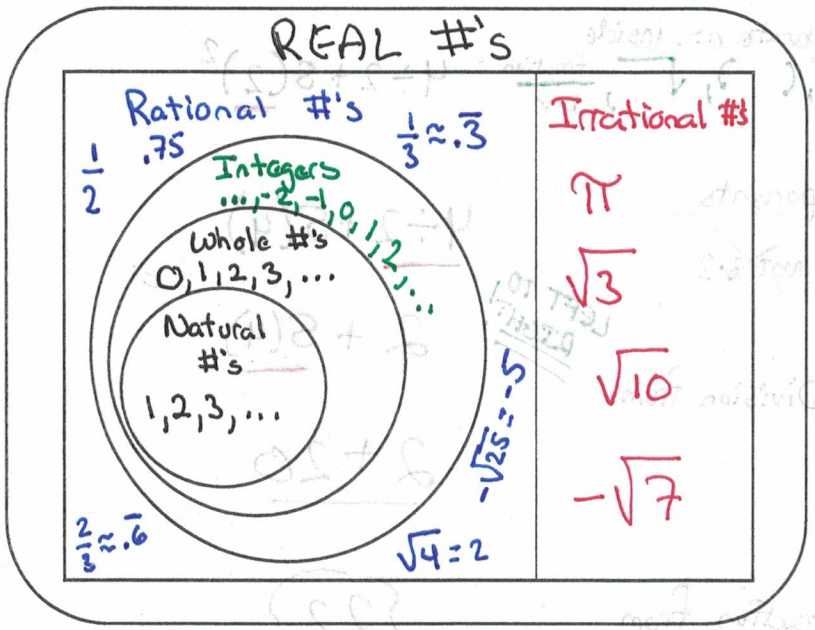
1.1 Real Numbers & The Order of Operations

ıe Venn Diagram below shows the "**Set of Real Numbers**" and the relationships between the different types of numbers.



THE SET OF REAL NUMBERS (means it continues)

Natural Numbers (aka counting numbers): 1, 2, 3, ...

No Fractions, No Decimals, No Negatives

Whole Numbers: 0, 1, 2, 3, ... ; are natural numbers and 0.

Integers: ..., -3, -2, -1, 0, 1, 2, 3, ... ; are whole #'s and their opposites.

NO FRACTIONS NO DECIMALS

Rational Numbers: are #'s that can be written in the form $\frac{a}{b}$ (Fraction), a and b are INTEGERS, $b \neq 0$; in decimal form they are repeating and terminating decimals.

Irrational Numbers: are numbers that cannot be written in the form $\frac{a}{b}$; in decimal form they are non-terminating and non-repeating. * If it can not be made into a fraction it is irrational.

Example 1: Classify each number by writing them in the correct column(s).

7	$\frac{1}{3} \approx .\overline{6}$	-8	Natural	Whole	Integer	Rational	Irrational
$\sqrt{3}$	4.5	1	7, 1, $\frac{6}{3}$	7, 1, $\frac{6}{3}$, 0	7, -8, 1, $-\sqrt{25}$, $\frac{6}{3}$, 0	7, $\frac{2}{3}$, -8, 4.5, $-\sqrt{25}$, $\frac{6}{3}$, 0, $\frac{8}{5}$	$\sqrt{3}$, π, 1.2345...
π	$-\sqrt{25} = -5$	$6/3 = 2$					
0	1.2345...	$8/5 = 1.6$					

Example 2: State what the sign of the answer will be (positive or negative) and then simplify.

a) $5 + (-7)$	b) $1 - (-4)$	c) $-5 - 7$	d) $(-8) + 8$	e) $9 - (-10)$	f) $8 + (-3)$
5 - 7	1 + 4		-8 + 8	9 + 10	8 - 3
N; -2	P; 5	N; -12	0 (zero is neither positive or negative)	P; 19	P; 5
g) $(-4)(-2)$	**h).** $3(-10)$	**i).** $6(7)$	**j)** $(-8)(7)$	**k).** $(-9)(-5)$	**l)** $(-1)(4)(-5)$
P; 8	N; -30	P; 42	N; -56	P; 45	P; 20
m) $(-6) \div (-3)$	**n)** $\frac{9}{3}$	**o)** $\frac{-48}{-6}$	**p)** $\frac{-36}{4}$	**q)** $\frac{81}{-9}$	**r)** $\frac{-50}{10}$
$\frac{-6}{-3}$ P; 2	P; 3	P; 8	N; -9	N; -9	N; 5

✱ **Order of Operations –** is a set of rules that tells you the order in which to perform mathematical operations in a mathematical statement. All people follow these rules so that they come to the same answer.

You know these rules as "**PEMDAS**" or "Please Excuse My Dear Aunt Sally". $4 \div 2 + 5(10-8)^2$

Please — Parentheses - clear any operations inside GROUPING SYMBOLS [ ], ( ), √, fraction bar

$4 \div 2 + 5(2)^2$

Excuse — Exponents - simplify exponents

Power { 3^{2} ← exponent, ← base } $\rightarrow 3 \cdot 3 = 9$ ~~NOT 3·2~~

$4 \div 2 + 5(4)$

My / **Dear** — Multiplication OR Division from Left to Right.

LEFT TO RIGHT!

$2 + 5(4)$

$2 + 20$

Aunt / **Sally** — Addition OR Subtraction from Left to Right

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Example 3: Use the Order of Operations to simplify each expression.

a) $6 - 10 \div 5$

$6 - 2$

4

b.) $4 \cdot 7 + 4 \div 2^2$

$4 \cdot 7 + 4 \div 4$

$28 + 4 \div 4$

$28 + 1$

29

c.) $2[(11-5)^2 \div 3]$

$2[(6)^2 \div 3]$

$2[36 \div 3]$

$2[12]$

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d.) $\dfrac{15(13-11)}{8-5}$

Simplify Top then bottom!

$\dfrac{15(2)}{8-5}$

$\dfrac{30}{8-5}$

$\dfrac{30}{3}$

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e.) $\frac{1}{3}\left[2(5-1) + \frac{2}{3}(9)\right]$

$\frac{1}{3}[2(4) + \frac{2}{3}(9)]$

$\frac{1}{3}[8 + \frac{2}{3}(9)]$

$\frac{1}{3}[8 + 6]$

$\frac{1}{3}(14)$

$\frac{14}{3}$

f.). $\dfrac{2+(3^4+1)}{4}$

$\dfrac{2+(81+1)}{4}$

$\dfrac{2+82}{4}$

$\dfrac{84}{4}$

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