

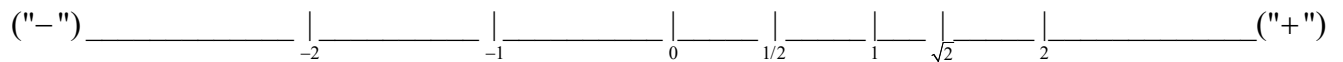
College Algebra - Introduction

[MATH by Wilson
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Algebra: Arithmetic with letters.

Note: Arithmetic is trying to lower our grade!

Number (#) Line: “Real” Numbers – one-part numbers



Note:

- a. $\frac{0}{b \neq 0} = 0$
- b. $\frac{a \neq 0}{0} = \text{Undefined}$
- c. $\frac{0}{0} = \text{Indeterminant ; will be discussed in Calculus}$

Types (Sets: (Collections, ...)) of Numbers:

- a. **Natural Numbers:** $\{1, 2, 3, 4, 5, \dots\}$
- b. **Whole Numbers:** $\{0, 1, 2, 3, 4, 5, \dots\}$
- c. **Integers:** $\{\dots - 4, -3, -2, -1, 0, 1, 2, 3, 4, \dots\}$
- d. **Rational (Fractional) Numbers:** $\left\{ \frac{a}{b} \mid a \text{ \& } b \text{ are Integers with } b \neq 0 \right\}$

Examples: $\frac{3}{5}, -\frac{7}{2}, \frac{2}{1} = 2, \dots$

Decimal representation repeats: $\frac{7}{11} = 0.636363\dots$

- e. **Irrational Numbers:** Non fractional numbers on the Number Line
Decimal representation does NOT repeat: $\sqrt{2} = 1.414213562\dots$

Examples: $\pi = 3.14159\dots$, $e = 2.7182818284590\dots$, $\sqrt{7} = 2.645751311\dots$

Expressions: Combinations of operations (+, -, ...), numbers, letters and grouping symbols ; NO “=”

Equations: “=” (There are many types of equations; we will study some of them)

1. **Linear** in “x” (unknown, variable) ; only one letter but can be different than “x”

a. “x” is the variable, unknown, ...

b. Linear implies power one (1): $x = x^{\text{Power}} = x^1$

c. Goal: Solve for x (Isolate “x”): $x = \frac{x}{1} = \# \text{ or } \#s$ when appropriate [No “x” on the RHS – Right Hand Side]

d. Types of Linear Equations

i. Conditional (1 solution only)

$$3x - 5 = x + 4$$

$$2x = 9$$

$$x = \frac{9}{2}$$

$$\frac{\quad}{0} \quad \bigg| \quad \frac{9}{2} \quad \frac{\quad}{\quad}$$

ii. Identity (Infinite solutions)

$$3x - 6 = 3(x - 2)$$

$$3x - 6 = 3x - 6$$

$$0 = 0$$

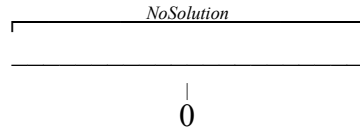
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iii. Contradiction (No solutions)

$$3x - 6 = 3(x + 2)$$

$$3x - 6 = 3x + 6$$

$$0 = 12 \Rightarrow \text{Contradiction (TRASH!)}$$



Note: **Always** draw the graph of the solution!

2. Literal (Letter) Equations – multiple letters

a. Considering linear now ; Examples: $ax + by = c$, $ax = b$, ...

b. **MUST** be given the “Letter” to “solve for”:

“Letter” = combination of other letters and #'s

3. Terms, Factors, and Exponents

a. **Terms:** Addition (+) and Subtraction (-)

Terms: Move across “=”

i. Change sign (“+” to “-“ **OR** “-“ to “+”)

ii. Keep position

Example: $2x - 3 = 4 \Rightarrow 2x = 4 + 3$

b. **Factors:** Multiplication (*) and Division (/)

Factors: Move across “=”

i. Keep sign

ii. Change position (“Numerator” to “Denominator” **Or** “Denominator” to “Numerator”)

Example: $4x = 5 \Rightarrow x = \frac{5}{4}$

Note: If there is a *term* property, there may or may NOT be a corresponding *factor* property!!

- c. **Exponents** (Shorthand for multiplication): $\text{BASE}^{\text{Exponent (power,...)}}$
where Base & Exponent are numbers

Example: $5^3 = 5 * 5 * 5$ (*Simple Example – much more will be said about exponents*)

4. **Order of Operations (Exponents, Factors, & Terms):**

- a. If grouping symbols ($[]$, $()$, $\{ \}$, ...) exist, perform the operations from the inner to outer grouping symbols (when fractions are encountered, treat the numerator and denominator separately) as follows
 - b. Exponents are to be evaluated first
 - c. Then, the operations of multiplication and division from left to right:
Factors \rightarrow
 - d. Finally, the operations of addition and subtraction from left to right:
Terms \rightarrow
5. TBD – To Be Determined ...