**Section 1-1 Notes: Real Numbers**

Intro: There are many different *types* of numbers and they’re often related to each other.

**Natural (Counting) Numbers:** 1, 2, 3, ...

**Whole Numbers:** 0, 1, 2, 3, ...

**Integers:** ..., -3, -2, -1, 0, 1, 2, 3, ...

**Rational Number:** (Fraction) *a/b* where *a* and *b* are integers and *b ­ 0*. (Rational numbers always *terminate* OR *repeat*)

Examples: 3/4; -0.1765451; .23232323...

**Irrational Numbers:** Not rational, meaning nonterminating and nonrepeating.

Examples: ¹; *e*; 

**Real Numbers:** The set of all rational and irrational numbers

So how are these dudes all related?


 **Properties of Real Numbers**

|  |  |  |
| --- | --- | --- |
| **Property** | **Addition** | **Multiplication** |
| *Closure*  | *a + b* is a real #  | *a • b* is a real #  |
| *Commutative*  | *a + b = b + a*  | *ab = ba*  |
| *Associative*  | *a + (b + c) = (a + b) + c*  | *a(bc) = (ab)c*  |
| *Identity*  | *a + 0 = a*  | *a • 1 = a*  |
| *Inverse*  | *a + (-a) = 0*  | *a •1/a = 1; a ­ 0*  |

**Distributive Property:** *a(b + c) = ab + ac*

**Closure:** Operation on two members of the set yields another member of the set

This means if you add any two real numbers
*a* and *b*, then *a + b* will be a real number too!

Your turn: Identify the properties shown below

a. *(3 + 9) + 8 = 3 + (9 + 8)* b. *14 • 1 = 14*

Note:

* (-a) is also called the ***additive inverse*** of *a*
* 1/a is also called the ***reciprocal*** of *a*

Definitions:
Subtraction: a - b = a + (-b)
Division: a/b = a • 1/b

Subtraction = difference addition = sum
Division = quotient multiplication = product

**Unit (Dimensional) Analysis**

Units work just like variables do!

Examples:
a. *345 miles - 120 miles = 225 miles*
b. *(2 hours)(60 miles/hour) = 120 miles*
c. *$24/3 hours = $8/hour* d. *(40 feet/second)(60 seconds/min) =
2400 feet/min*

Your turn: Simplify
a. If you’re driving 45 miles per hour. How many feet per second are you driving?
(Hint: 5280 feet = 1 mile)

**Section 1-2 Notes: Algebraic Expressions and Models**

**Numerical Expression:** Working with numbers
 **Algebraic Expression:** Working with variables

Example: *25 = 2 • 2 • 2 • 2 • 2 = 32*
“2” is the **base** “5” is the **exponent

Order of Operations:** **PEMDAS
P = Parentheses** *(grouping symbols)* **E = Exponents
MD = Multiplication/Division** *(from left to right)***AS = Addition/Subtraction** *(from left to right)*
Example: Simplify *-4 + 2(-2 + 5)2*

Solution: *-4 + 2(3)2* (Did parentheses)
*= -4 + 2(9)* (Did exponent)
*= - 4 + 18* (Did multiplication)
*= 14* (Did addition)

**Substitution Property**

Example: Evaluate *-3x2 - 5x + 7* when *x = -2*Solution: -3(-2)2 - 5(-2) + 7 (Substitute x = -2)
= -3(4) - 5(-2) + 7 (Did Exponent)
= -12 + 10 + 7 (Did Multiplication)
= 5 (Did Addition)

Definitions: Example:
**Constant:** a number *3*
**Variable:** a letter *x*
**Coefficient:** number in front of a letter *4* in *4x*

Example: You want to buy either a CD or a cassette for 10 people. CDs cost $13 each and cassettes cost $8 each. Write an expression for the total amount you must spend.

Solution:
(1) Define your variables
Let x = # of CDs, y = # of cassettes, C = Cost
(2) Write your expression
***13x + 8y = C***Your turn: How much would it cost you if you gave 4 people cassettes and the rest CDs?