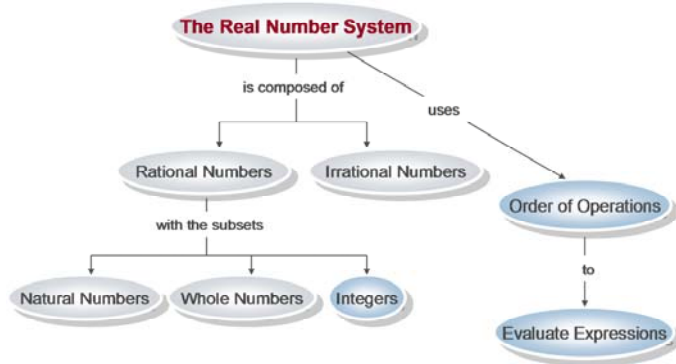


### 03: The Real Number System

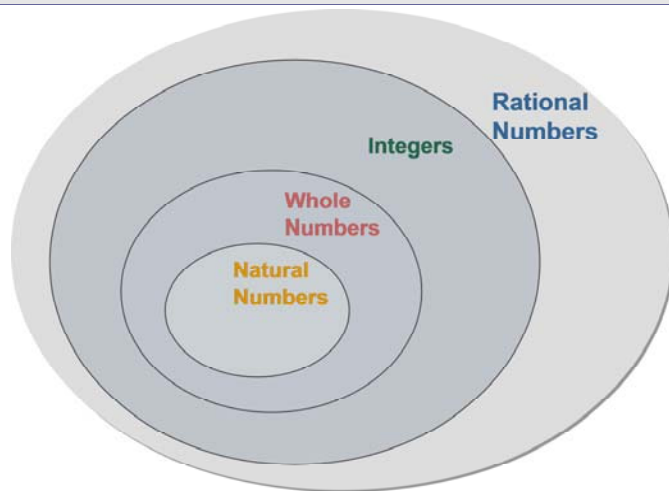
#### Key Terms

- **Integer:** any whole number, its opposite, or zero; {...-3, -2, -1, 0, 1, 2, 3, ...}.
- **Irrational number:** a number that cannot be written as the ratio of two integers.
- **Natural number:** the counting numbers; {1, 2, 3, ...}.
- **Rational number:** a number that can be written as the ratio of two integers  $a$  and  $b$ ,  $\frac{a}{b}$ , where  $b \neq 0$ .
- **Real number:** a number that can be represented with a point on the real number line; either rational or irrational.
- **Subset:** a mathematical set whose elements are contained in another set.
- **Whole number:** any nonnegative integer; {0, 1, 2, 3, ...}.

#### Concept Map



#### Rational Number Subsets



#### Order of Operations (PEMDAS)

- Parentheses
  - Exponents
  - Multiplication
  - Division
  - Addition
  - Subtraction
- "Please Excuse My Dear Aunt Sally"*

#### Example: Order of Operations

Evaluate the math expression  $2(7 - 3)^2 \div 8 + 9$ .

$2(7 - 3)^2 \div 8 + 9$	
$= 2(4)^2 \div 8 + 9$	Parentheses: $7 - 3 = 4$
$= 2(16)(4) \div 8 + 9$	
$= 2(16) \div 8 + 9$	Exponent: $4^2 = 4(4) = 16$
$= 32 \div 8 + 9$	Multiplication/Division: $2(16) = 32$
$= 4 + 9$	Multiplication/Division: $32 \div 8 = 4$
$= 13$	Addition/Subtraction: $4 + 9 = 13$

#### Addition Rule: Like Signs

When adding numbers with like signs, add the absolute values of the numbers and keep the sign.

Example:  
 $-3 - 9 = -(3 + 9) = -12$

#### Addition Rule: Unlike Signs

When adding numbers with unlike signs, subtract the smaller absolute value from the larger absolute value. Keep the sign of the number with the larger absolute value.

Example:  
 $2 + (-6) = -(6 - 2) = -4$

#### Multiplication/Division Rule: Like Signs

When multiplying or dividing two numbers with like signs, the result will be positive.

Example:  
 $-15 \div (-5) = 3$

#### Multiplication/Division Rule: Unlike Signs

When multiplying or dividing two numbers with unlike signs, the result will be negative.

Example:  
 $7(-2) = -14$

#### Reminders and Shortcuts

- The decimal approximation of an irrational number does not terminate or repeat.
- The decimal equivalent of a rational number will either terminate or repeat.
- A line over digits behind a decimal point indicates those digits repeat infinitely.
- An integer can be written as a ratio by putting the integer over 1 in a fraction.
- Adding a negative number is the same as subtracting that number:  $a + (-b) = a - b$ .
- Addition and multiplication are commutative: the value of the expression will not change when the terms are reordered.
- The product (or quotient) of numbers with the same sign is positive.
- The product (or quotient) of numbers with different signs is negative.
- Use the acronym PEMDAS to remember the correct order of operations.
- Perform multiplication and division from left to right.
- Perform addition and subtraction from left to right.

**How to Use This Cheat Sheet:** These are the key concepts related to this topic. Try to read through it carefully twice then rewrite it out on a blank sheet of paper. Review it again before the exam.