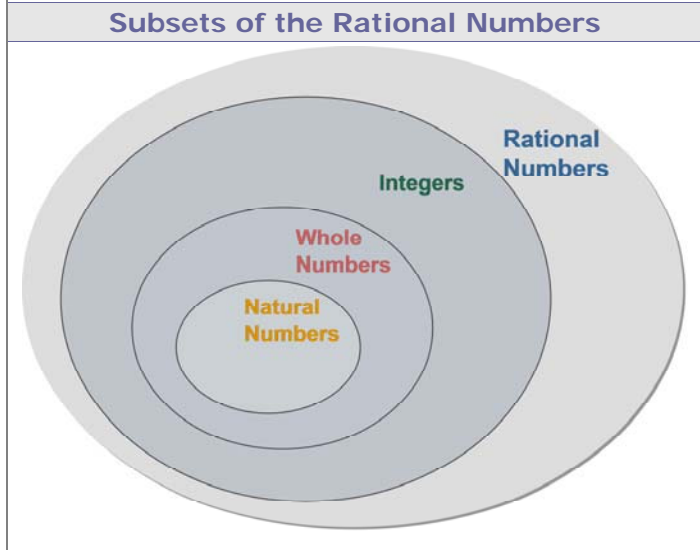
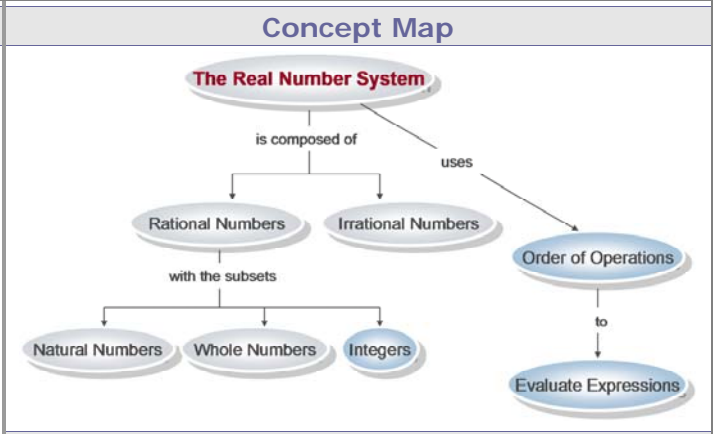


03: The Real Number System

Key Terms

- **Integer:** any whole number or its opposite. {...-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 is either rational or irrational.
- **Subset:** a mathematical set whose elements are contained in another set.
- **Whole Number:** any nonnegative integer. {0, 1, 2, 3, ...}



Order of Operations (PEMDAS)

- Parentheses
- Exponents
- Multiplication
- Division
- Addition
- Subtraction

“Please Excuse My Dear Aunt Sally”

Addition Rule: Like Signs

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

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

Example: Order of Operations

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

$$\begin{aligned}
 &2(7 - 3)^2 \div 8 + 9 \\
 &= 2(4)^2 \div 8 + 9 && \text{Parentheses: } 7 - 3 = 4 \\
 &= 2(4)(4) \div 8 + 9 \\
 &= 2(16) \div 8 + 9 && \text{Exponent: } 4^2 = 4(4) = 16 \\
 &= 32 \div 8 + 9 && \text{Multiplication/Division: } 2(16) = 32 \\
 &= 4 + 9 && \text{Multiplication/Division: } 32 \div 8 = 4 \\
 &= 13 && \text{Addition/Subtraction: } 4 + 9 = 13
 \end{aligned}$$

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

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.

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:
 $7(-2) = -14$

How to Use This Cheat Sheet: These are the keys related this topic. Try to read through it carefully twice then write it out on a blank sheet of paper. Review it again before the exams.