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Algebra 1 - REA's Quick Access Reference Chart (Quick Access Reference Charts)

FAST FACTS REVIEW

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ALGEBRA I

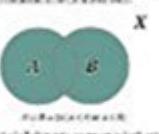
SETS AND SET OPERATIONS

A. ELEMENTS

- The word element is used in the sense of a member.
- The word set is used in the sense of a collection of elements.
- Set A is a set of elements. If a is an element of A , we say $a \in A$.
- Intersection of two sets A and B is the set of elements common to both sets. $A \cap B$ is the intersection of sets A and B .
- Universal set X is a set from which other sets are derived.
- Complement of a set A is the set of elements in the universal set X that are not in the set A .
- Set A is a subset of set B if every element of A is an element of B .

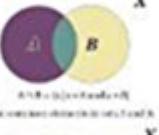
B. SET OPERATIONS

- Set operations may be represented graphically by Venn diagrams.
- Intersection of sets A and B :



$A \cap B = \{x | x \in A \text{ and } x \in B\}$

- Complement of a set A relative to a universal set X :



$A^c = \{x | x \in X \text{ and } x \notin A\}$

- Union of sets A and B :



$A \cup B = A \cap B^c$

C. LAWS OF SET OPERATIONS

- Commutative law of union: $A \cup B = B \cup A$.
- Associative law of union: $(A \cup B) \cup C = A \cup (B \cup C)$.
- Intersection is distributive over union: $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.
- Complement is distributive over union: $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.
- Complement is distributive over intersection: $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.
- De Morgan's law: $(A \cup B)^c = A^c \cap B^c$.

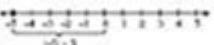
NUMBER SYSTEMS, ALGEBRAIC LAWS AND OPERATIONS

A. NUMBER SYSTEMS

- Whole numbers: the set of counting numbers and zero: e.g. $0, 1, 2, 3, \dots$.
- Integers: the set of whole numbers, negative whole numbers, and zero: e.g. $\dots, -2, -1, 0, 1, 2, \dots$.

B. ABSOLUTE VALUE

- Absolute value of a number a is the distance from a to zero on the number line.



$|a| = \begin{cases} a & \text{if } a \geq 0 \\ -a & \text{if } a < 0 \end{cases}$

C. ADDITIVE LAW

- Closure under addition: $a + b$ is a real number.
- Commutative law of addition: $a + b = b + a$.
- Associative law of addition: $(a + b) + c = a + (b + c)$.
- Identity element for addition: $a + 0 = a$.
- Inverse elements for addition: $a + (-a) = 0$.
- Associativity with 0 :

$$(a + b) + 0 = a + b \quad a + (b + 0) = a + b$$

- Identity element for multiplication: $a \cdot 1 = a$.
- Inverse elements for multiplication: $a \cdot \frac{1}{a} = 1$.
- Zero: $0 \cdot a = 0$.
- Multiplication: $a \cdot b = b \cdot a$ and $a \cdot (b \cdot c) = (a \cdot b) \cdot c$.

D. DECIMALS

- Decimal: A decimal is a ratio for division in the form a/b , where a and b are integers and $b \neq 0$.
- Repeating decimal: a decimal in which a digit or block of digits repeats.
- Repeating decimal: $0.\overline{123} = 0.123123123\dots$
- Nonterminating decimal: a decimal that does not terminate.
- Terminating decimal: $0.123 = 0.123000\dots$

E. IMAGINARY AND COMPLEX NUMBERS

- Imaginary: $i = \sqrt{-1}$.
- Complex numbers: $a + bi$, where a and b are real numbers and $i^2 = -1$.
- Conjugate: $a + bi$ and $a - bi$ are called the complex conjugates.
- Product of complex numbers: $(a + bi)(c + di) = (ac - bd) + (ad + bc)i$.

F. EXPONENTS AND RADICALS

A. EXPONENTS

- Product of like powers: $a^m \cdot a^n = a^{m+n}$.
- Quotient of powers: $a^m / a^n = a^{m-n}$.
- Negative exponent: $a^{-n} = \frac{1}{a^n}$.
- Product of powers with exponents: $(a^m)^n = a^{mn}$.
- Quotient of powers with exponents: $(a^m)^n = a^{m-n}$.
- Exponential form: $a^m = \sqrt[m]{a^m}$.
- Product of a radical and a rational: $\sqrt[n]{a} \cdot b = \sqrt[n]{a \cdot b^n} = \sqrt[n]{ab^n}$.

B. RADICALS

- Product of radicals: $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$.
- Quotient of radicals: $\sqrt[n]{a} / \sqrt[n]{b} = \sqrt[n]{a/b}$.
- Product of powers with rational exponents: $(a^m)^n = a^{mn}$.
- Quotient of powers with rational exponents: $(a^m)^n = a^{m-n}$.
- Product of a radical and a rational: $\sqrt[n]{a} \cdot b = \sqrt[n]{a \cdot b^n} = \sqrt[n]{ab^n}$.

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