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

FAST FACTS REVIEW
Quick Access **ALGEBRA I**

SETS AND SET OPERATIONS

A. DEFINITIONS

- Set: a collection of items, each called an element or member.
- Finite set: a set with a finite number of elements. Example: the set of integers $\{1, 2, 3, 4, 5\}$ or the set of letters $\{A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z\}$.
- Subset: if A is a set, then B is a subset of A if every element of B is also an element of A .
- Equivalent sets: two sets are equivalent if they have the same number of elements.
- Disjoint sets: two sets are disjoint if they have no elements in common.

B. SET OPERATIONS

Set operations are the operations of union, intersection, and complement.

- Union: the set of all elements in A or B or both.

C. LAWS OF SET OPERATIONS

If A is a set of elements and B is a set of elements, then:

- Identity: $A \cup \emptyset = A$ and $A \cap A = A$.
- Subgroup: $A \cap A = A$ and $A \cup \emptyset = A$.
- Commutative: $A \cup B = B \cup A$ and $A \cap B = B \cap A$.
- Associative: $(A \cup B) \cup C = A \cup (B \cup C)$ and $(A \cap B) \cap C = A \cap (B \cap C)$.
- Distributive: $(A \cup B) \cap C = (A \cap C) \cup (B \cap C)$ and $(A \cap B) \cup C = (A \cup C) \cap (B \cup C)$.
- De Morgan's: $(A \cup B)^c = A^c \cap B^c$ and $(A \cap B)^c = A^c \cup B^c$.

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., $\dots, -3, -2, -1, 0, 1, 2, 3, \dots$.
- Rational numbers: the set of all numbers that can be expressed as the ratio of two integers, e.g., $\frac{1}{2}, \frac{3}{4}, -\frac{5}{6}, 0, 1, 2, 3, \dots$.
- Real numbers: the set of all numbers that can be represented by points on a number line.

B. ALGEBRAIC LAWS

- Commutative: $a + b = b + a$ and $ab = ba$.
- Associative: $(a + b) + c = a + (b + c)$ and $(ab)c = a(bc)$.
- Distributive: $a(b + c) = ab + ac$ and $(a + b)c = ac + bc$.
- Identity: $a + 0 = a$ and $a \cdot 1 = a$.
- Inverse: $a + (-a) = 0$ and $a \cdot \frac{1}{a} = 1$ (for $a \neq 0$).
- Zero: $a \cdot 0 = 0$ and $0 \cdot a = 0$.
- Division: $\frac{a}{b} = a \cdot \frac{1}{b}$ (for $b \neq 0$).

C. OPERATIONAL LAWS

- Order of operations: $PEMDAS$ (Parentheses, Exponents, Multiplication and Division, Addition and Subtraction).
- Exponents: $a^m \cdot a^n = a^{m+n}$, $\frac{a^m}{a^n} = a^{m-n}$, $(a^m)^n = a^{m \cdot n}$.
- Radicals: $\sqrt{a} \cdot \sqrt{b} = \sqrt{ab}$, $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$, $(\sqrt{a})^2 = a$.

D. REAL NUMBERS

- Order of operations: $PEMDAS$.
- Exponents: $a^m \cdot a^n = a^{m+n}$, $\frac{a^m}{a^n} = a^{m-n}$, $(a^m)^n = a^{m \cdot n}$.
- Radicals: $\sqrt{a} \cdot \sqrt{b} = \sqrt{ab}$, $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$, $(\sqrt{a})^2 = a$.

E. IMAGINARY AND COMPLEX NUMBERS

- Imaginary number: $i^2 = -1$.
- Complex number: $a + bi$, where a and b are real numbers.
- Operations: $(a + bi) + (c + di) = (a + c) + (b + d)i$, $(a + bi)(c + di) = (ac - bd) + (ad + bc)i$.

EXONENTS AND RADICALS

A. EXPONENTS

- Exponent: a^n , where a is the base and n is the exponent.
- Power of a power: $(a^m)^n = a^{m \cdot n}$.
- Negative exponent: $a^{-n} = \frac{1}{a^n}$.
- Product of powers: $a^m \cdot a^n = a^{m+n}$.
- Quotient of powers: $\frac{a^m}{a^n} = a^{m-n}$.
- Power of a product: $(ab)^n = a^n \cdot b^n$.
- Power of a quotient: $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$.
- Order of operations: the power rule is applied first, then multiplication and division, then addition and subtraction.

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Synopsis

Fast Facts at Your Fingertips! REA's Quick Access Study Charts contain all the information students, teachers, and professionals need in one handy reference. They provide quick, easy access to important facts. The charts contain commonly used mathematical formulas, historical facts, language conjugations, vocabulary and more! Great for exams, classroom reference, or a quick refresher on the subject. Most laminated charts consist of 2 fold-out panels (4 pages) that fit into any briefcase or backpack. Each chart has a 3-hole punch for easy placement in a binder. Each chart measures 8 1/2" x 11"

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