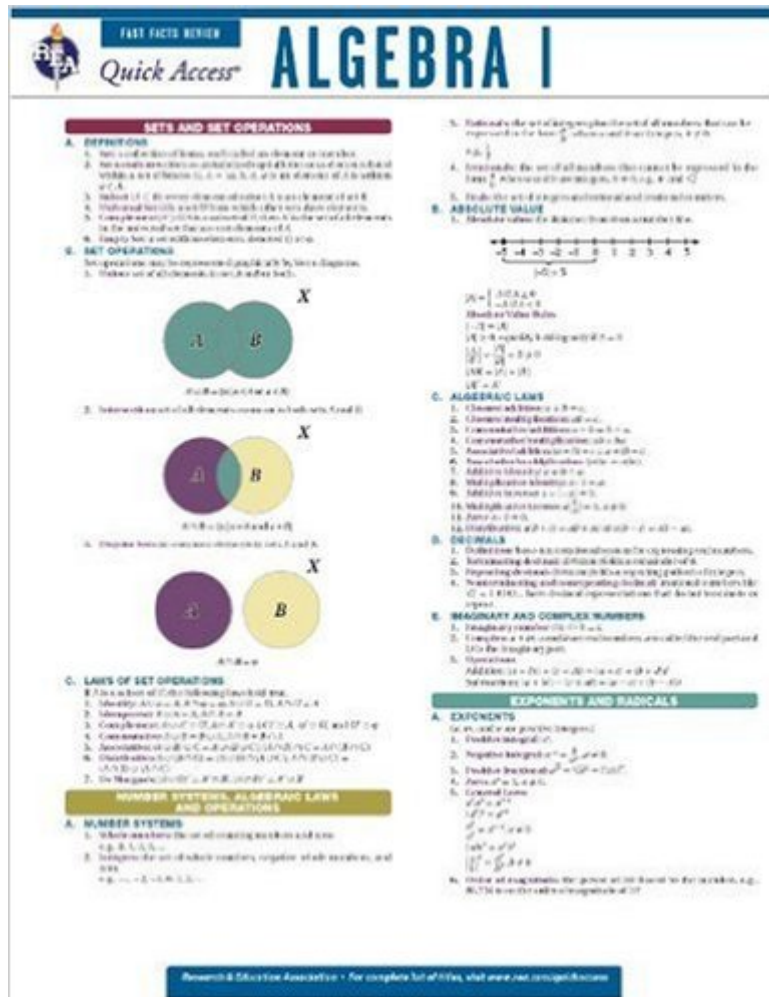


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Algebra 1 - REA's Quick Access Reference Chart (Quick Access Reference Charts)



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 of α, β, γ .
- Subset: $A \subseteq B$ if every element of set A is also an element of set B .
- Equivalent sets: a set A is equivalent to set B if they have the same number of elements.
- Complement: the set of all elements in the universal set U that are not in set A .
- Disjoint sets: two sets with no elements in common.

B. SET OPERATIONS

Set operations can be represented graphically with Venn diagrams.

- Union: set of all elements from both sets.

Diagram 1: Two overlapping circles A and B within a universal set X .
 $A \cup B = (A \cap B) \cup (A \cap B^c) \cup (A^c \cap B)$

- Intersection: set of all elements common to both sets.

Diagram 2: Two overlapping circles A and B within a universal set X .
 $A \cap B = (A \cap B) \cup (A^c \cap B)$

- Disjoint sets: two sets with no elements in common.

Diagram 3: Two disjoint circles A and B within a universal set X .
 $A \cap B = \emptyset$

C. LAWS OF SET OPERATIONS

1. Identity: $A \cup \emptyset = A$; $A \cap U = A$

2. Subproperty: $A \cap (A \cup B) = A$

3. Complement: $A \cup A^c = U$; $A \cap A^c = \emptyset$

4. Commutative: $A \cup B = B \cup A$; $A \cap B = B \cap A$

5. Associative: $(A \cup B) \cup C = A \cup (B \cup C)$; $(A \cap B) \cap C = A \cap (B \cap C)$

6. Distributive: $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$; $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

7. De Morgan's: $(A \cup B)^c = A^c \cap B^c$; $(A \cap B)^c = A^c \cup B^c$

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. $\dots, -2, -1, 0, 1, 2, \dots$

B. OPERATIONS

- Subtraction: the set of all integers.
- Rational numbers: the set of all numbers that can be expressed in the form $\frac{a}{b}$, where a and b are integers, $b \neq 0$.
- Real numbers: the set of all numbers that cannot be expressed in the form $\frac{a}{b}$, where a and b are integers, $b \neq 0$, e.g. π and $\sqrt{2}$.

5. Rational numbers: the set of all rational numbers.

ABOLUTE VALUE

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

Diagram: A number line showing the absolute value of -4 and 5 as their distance from zero.

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

Properties:

- $|x| \geq 0$
- $|x| = |-x|$ (Absolute Value Rule)
- $|x| = |y|$ if and only if $x = y$ or $x = -y$
- $|x| \geq 0$ implies $x \geq 0$ or $x \leq 0$
- $|x| = |y|$ implies $x = y$ or $x = -y$
- $|x| = |y|$ implies $x^2 = y^2$
- $|x| = |y|$ implies $x^2 = y^2$
- $|x| = |y|$ implies $x^2 = y^2$

C. ALGEBRAIC LAWS

- Commutative: $a + b = b + a$; $ab = ba$
- Associative: $(a + b) + c = a + (b + c)$; $(ab)c = a(bc)$
- Distributive: $a(b + c) = ab + ac$
- Identity: $a + 0 = a$; $a \cdot 1 = a$
- Inverse: $a + (-a) = 0$; $a \cdot \frac{1}{a} = 1$ ($a \neq 0$)
- Zero: $a \cdot 0 = 0$; $0 \cdot a = 0$
- Division: $\frac{a}{b} = a \cdot \frac{1}{b}$ ($b \neq 0$)
- Order of operations: $a + (b - c) \cdot d = a + (b - c) \cdot d$

D. OPERATIONAL LAWS

- Order of operations: $a + (b - c) \cdot d = a + (b - c) \cdot d$
- Exponentiation: $a^m \cdot a^n = a^{m+n}$
- Power of a power: $(a^m)^n = a^{m \cdot n}$
- 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 quotient: $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$
- Power of a power: $(a^m)^n = a^{m \cdot n}$
- Power of a product: $(ab)^n = a^n \cdot b^n$
- Power of a power: $(a^m)^n = a^{m \cdot n}$
- Power of a power: $(a^m)^n = a^{m \cdot n}$

E. IMAGINARY AND COMPLEX NUMBERS

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

EXONENTS AND RADICALS

A. EXPONENTS

- Exponentiation: $a^m \cdot a^n = a^{m+n}$
- Power of a power: $(a^m)^n = a^{m \cdot n}$
- Product of powers: $a^m \cdot a^n = a^{m+n}$
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- Power of a power: $(a^m)^n = a^{m \cdot n}$

B. RADICALS

- Order of operations: $a + (b - c) \cdot d = a + (b - c) \cdot d$
- Exponentiation: $a^m \cdot a^n = a^{m+n}$
- Power of a power: $(a^m)^n = a^{m \cdot n}$
- Product of powers: $a^m \cdot a^n = a^{m+n}$
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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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