# Algebra Textbook Contents

## Chapter P: Prerequisites: Fundamental Concepts of Algebra

### P.1 Algebraic Expressions and Real Numbers

**Algebraic Expressions**

* An algebraic expression is a mathematical phrase that involves variables, numbers, and operations (+, -, x, ÷).
* Variables are symbols that represent unknown values.

**Types of Algebraic Expressions**

* **Monomial:** An expression with one term. (e.g., 2x)
* **Binomial:** An expression with two terms. (e.g., 3x + 5)
* **Trinomial:** An expression with three terms. (e.g., 2x^2 - 5x + 3)
* **Polynomial:** An expression with one or more terms, where the variables have non-negative integer exponents.

**Operations on Algebraic Expressions**

* **Addition and Subtraction:** Combine like terms (terms with the same variable and exponent).
* **Multiplication:** Multiply each term of one expression by each term of the other expression.
* **Division:** Divide each term of the numerator by each term of the denominator.
* **Factoring:** Express an expression as a product of smaller factors.

**Real Numbers**

* **Definition:** The set of all numbers that can be represented on a number line, including rational and irrational numbers.
* **Types of Real Numbers**
  + **Integers:** Numbers without fractional or decimal parts (..., -3, -2, -1, 0, 1, 2, 3, ...).
  + **Rational Numbers:** Numbers that can be expressed as a fraction of two integers (e.g., 1/2, -3/4).
  + **Irrational Numbers:** Numbers that cannot be expressed as a fraction of two integers (e.g., √2, π).

**Properties of Real Numbers**

* **Commutative Property:** The order of the numbers in an operation does not affect the result (e.g., a + b = b + a).
* **Associative Property:** The grouping of numbers in an operation does not affect the result (e.g., (a + b) + c = a + (b + c)).
* **Distributive Property:** Multiplication over addition/subtraction (e.g., a(b + c) = ab + ac).

**Order of Operations (PEMDAS)**

* **P:** Parentheses first
* **E:** Exponents (powers)
* **M:** Multiplication
* **D:** Division
* **A:** Addition
* **S:** Subtraction

### P.2 Exponents and Scientific Notation

**Exponents**

* **Exponent:** A number that tells how many times a base is multiplied by itself.
* **Base:** The number being multiplied.

**Notation:**

a^n = base^exponent

where:

* a is the base
* n is the exponent

**Examples:**

* 2³ = 2 × 2 × 2 = 8
* 10⁴ = 10 × 10 × 10 × 10 = 10,000

**Rules of Exponents:**

* **Multiplication:**
  + a^m × a^n = a^(m + n)
* **Division:**
  + a^m ÷ a^n = a^(m - n)
* **Raising a Power to a Power:**
  + (a^m)^n = a^(m × n)
* **Zero Exponent:**
  + a⁰ = 1 for any a ≠ 0
* **Negative Exponents:**
  + a^-m = 1/a^m

**Scientific Notation**

* A way of writing very large or very small numbers in a more manageable form.
* Expresses the number as a decimal between 1 and 10 multiplied by a power of 10.

**Notation:**

a × 10^n

where:

* a is a decimal between 1 and 10
* n is an integer

**Examples:**

* 602,200,000,000,000,000,000,000 = 6.022 × 10^23
* 0.00000000000000000000000000006 = 6 × 10^-23

**Advantages of Scientific Notation:**

* Makes calculations easier
* Standardizes the representation of large and small numbers
* Reduces the risk of making errors

### P.3 Radicals and Rational Exponents

### P.4 Polynomials

### P.5 Factoring Polynomials

### P.6 Rational Expressions

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### P.8 Modeling with Equations

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