

## Chapter P Prerequisites

### Section P.1

**Real numbers** – The set numbers formed by joining the set of rational numbers and the set of irrational numbers

**Rational numbers** – Real numbers that can be written as the ratio  $p/q$  of two integers, where  $q \neq 0$

**Irrational numbers** – Real numbers that cannot be written as the ratio of two integers

**Real number line** – A line used to graphically represent the set of real numbers

**Origin** – The point 0 on the real number line

**Coordinate** – A real number that corresponds to a point on the real number line

**Inequality** – A statement that represents an order relationship

**Positive infinity** – A symbol used to describe the unboundedness of an interval in the positive direction

**Negative infinity** – A symbol used to describe the unboundedness of an interval in the negative direction

**Absolute Value** – (Informal) The magnitude or distance between the origin and the point representing a real number on the real number line

(Formal) If  $a$  is a real number, then the absolute value of  $a$  is

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

**Distance between two points** – Let  $a$  and  $b$  be real numbers. The distance between  $a$  and  $b$  on the real number line is

$$d(a, b) = |b - a| = |a - b|$$

**Variable** – A letter that represents an unknown quantity

**Constant** – A real number term in an algebraic expression

**Algebraic expression** – A collection of letters (variables) and real numbers (constants) combined using the operations of addition, subtraction, multiplication, division, and exponentiation

**Evaluate an expression** – To find the value of an algebraic expression by substituting numerical values for each of the variables in the algebraic expression

**Additive Inverse** – The opposite of a real number. If  $b$  is a real number, then  $-b$  is the additive inverse.

**Multiplicative Inverse** – The reciprocal of a real number. If  $b$  is a real number, then  $1/b$  is the multiplicative inverse.

**Factors** – If  $a$ ,  $b$ , and  $c$  are integers such that  $ab = c$ , then  $a$  and  $b$  are factors or divisors of  $c$

**Prime number** – An integer that has exactly two positive factors: itself and 1

**Composite number** – An integer that can be written as the product of two or more prime numbers

### Section P.2

**Exponential form** – A form of notation for writing a repeated multiplication using exponents. More generally, if  $a$  is a real number, variable, or algebraic expression and  $n$  is a positive integer, then

$$a^n = \underbrace{a \cdot a \cdot a \cdots a}_{n \text{ factors}}$$

**Exponent** – Indicates the number of times the base is used as a factor. In the expression  $a^n$ ,  $n$  is called the exponent.

**Base** – A number, variable, or algebraic expression that is In the expression  $a^n$ ,  $a$  is called the base

**Scientific Notation** – A real number written in the form  $\pm c \times 10^n$ , where  $1 \leq c \leq 10$  and  $n$  is an integer

**Square root** – One of a number's two equal factors

**Cube root** – One of a number's three equal factors

**Principal  $n$ th root** – Let  $a$  be a real number that has at least one  $n$ th root. The principal  $n$ th root of  $a$  is the

$n$ th root that has the same sign as  $a$ . It is denoted by the symbol:  $\sqrt[n]{a}$

**Simplest form** – An expression involving radicals is in simplest form when the following conditions are satisfied:

1. All possible factors have been removed from the radical.
2. All fractions have radical-free denominators (accomplished by a process called rationalizing the denominator.)
3. The index of the radical is reduced.

**Conjugate** – An expression that differs from another expression only by the sign between the terms. The expressions  $a + b\sqrt{m}$  and  $a - b\sqrt{m}$  are conjugates of each other.

**Rational exponent**- If  $a$  is a real number and  $n$  is a positive integer such that the principle  $n$ th root of  $a$  exists, then  $a^{1/n} = \sqrt[n]{a}$ , where  $1/n$  is the rational exponent of  $a$ .

### Section P.3

**Polynomial** – Let  $a_0, a_1, a_2, \dots, a_n$  be real numbers and let  $n$  be a nonnegative integer. A polynomial in  $x$  is an expression of the form  $a_nx^n + a_{n-1}x^{n-1} + \dots + a_1x + a_0$  where  $a_n \neq 0$ .

**FOIL Method** – A method of multiplying two binomials in which FOIL is an acronym (First, Outer, Inner, Last) for the products of the terms

**Factoring** – The process of writing a polynomial as a product

**Factoring by grouping** – A method of factoring polynomials with more than three terms

### Section P.4

**Domain** – The set of real numbers for which an algebraic expression is defined

**Equivalent** – Two algebraic expressions are equivalent if they have the same domain and yield the same values for all numbers in their domain.

**Rational expression** – The quotient of two polynomials

**Complex fractions** – Fractional expressions with separate fractions in the numerator, denominator, or both

### Section P.5

**Cartesian plane** – A plane formed by using two real number lines intersecting at right angles, named after the French mathematician Rene' Descartes

**Rectangular coordinate system** – A plane (Cartesian plane) used to graphically represent ordered pairs of real numbers

**Distance Formula** – The distance  $d$  between the points  $(x_1, y_1)$  and  $(x_2, y_2)$  in the plane is

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} .$$

**Midpoint Formula** – The midpoint of the segment joining the points  $(x_1, y_1)$  and  $(x_2, y_2)$  is

$$\text{Midpoint} = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right).$$