

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

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

Origin – The point 0 on the real number line

Order – If a and b are real numbers, a is less than b if $b - a$ is positive

Inequality – A statement that represents an order relationship

Infinity – A symbol used to describe the unboundedness of an interval

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 numbers – Let a and b be real numbers. The distance between a and b on the real number line is

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

Variables – Letters that represent unknown quantities

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

Constant – A non-variable term in an algebraic expression

Coefficient – The numerical factor of a variable term

Evaluate – 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 repeated multiplication using exponents. More generally, if a is a real number and n is a positive integer, then

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

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: $\sqrt[n]{a}$

Index – The positive integer n in the radical symbol $\sqrt[n]{a}$

Radicand – The number a in the radical 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 $a_n \neq 0$.

Degree – The sum of the exponents of the variables in a term. The degree of a polynomial is the highest degree of its terms.

Section P.4

Factoring – The process of writing a polynomial as a product

Section P.5

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.7

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

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

Ordered pair – Two real numbers x and y , written (x, y) , which represent a point in the Cartesian plane

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

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