

# High School Math Content Standards

## PreAlgebra Content Standards

### Estimation

- Use estimation to check reasonableness of answers or make predictions
- Apply appropriate estimation strategies to problem solving, including integers, fractions, decimals, averages, exponents, square roots, and graphing data

### Number Sense

- Compare and order real numbers using  $<$ ,  $^2$ ,  $>$ ,  $^3$  and  $=$
- Develop and apply number theory concepts including primes, factors, multiples, LCM, GCF, divisibility, and equivalent fractions
- Apply ratios, proportions and percents in a variety of situations
- Explore other number systems and bases

### Concepts of Number Operations

- Understand and use the language of mathematics to set up and solve problems
- Model and describe different problem situations using manipulatives and other representations
- Understand and use properties of real numbers
- Understand and use the properties of equality and inequality
- Use exponential notation including scientific notation

### Computation

- Simplify and evaluate expressions using order of operations
- Simplify expressions involving integers, fractions, decimals, percents, and variables
- Select and use appropriate method for computing: mental math, pencil and paper, calculator/computer
- Perform operations with exponents and square roots
- Understand and use absolute value of real numbers

### Geometry

- Identify, classify, and compare two-dimensional figures and three-dimensional figures
- Construct and draw models of two-dimensional and three-dimensional figures
- Classify lines, angles, triangles, and quadrilaterals

- Understand and use concepts of congruency, similarity, and symmetry
- Perform transformations including reflections, rotations, and slides
- Use formulas for perimeter and area of circles, triangles, and other polygons
- Use formulas for surface area and volume of three-dimensional figures including spheres
- Use the Pythagorean Theorem
- Use characteristics of polygons to understand tessellations

## **Measurement**

- Measure using standard and metric units and make comparisons of similar units
- Use formulas and develop procedures for measuring area, perimeter, surface area, and volume
- Solve problems involving proportions, figures drawn to scale, and similar figures
- Use formulas involving rate, time, and temperature

## **Statistics**

- Conduct experiments and collect data
- Display data in an appropriate format including table, circle graph, histogram, scatter plot, and line graph
- Analyze data found in graphs, tables, and charts
- Describe data using measures of central tendency (mean, median, mode) and range
- Use data to make and defend conclusions

## **Probability**

- Determine probability of a simple event
- Conduct an experiment and use the data to find the probability of a simple event
- Calculate probabilities for independent events

## **Patterns**

- Explore historic math patterns including primes and Pascal's Triangle
- Analyze a sequence, find a pattern, and express it as a rule
- Recognize visual and numeric problem solving situations

## **Algebra**

- Develop the terminology of algebra
- Apply properties of real numbers to simplify expressions
- Apply properties of equality to solve one and two step equations
- Apply properties of inequality to solve one and two step inequalities

- Organize work and demonstrate all steps in simplifying expressions and solving equations
- Translate verbal expressions and sentences to algebraic expressions, equations, and inequalities
- Create a word problem from a symbolic statement
- Understand and use concepts related to linear equations including slope and intercepts

## Algebra I Content Standards

### Number Sense

- Identify and compare all major subsets of the real numbers.
- Distinguish between rational and irrational numbers.
- Compare and order real numbers using  $<$ ,  $\leq$ ,  $>$ ,  $\geq$ , and  $=$ .
- Apply concepts of primes, factors, and multiples to expressions containing variables.
- Give a rational approximation for an irrational number.

### Computation

- Perform operations with signed numbers and variables.
- Simplify expressions involving roots and exponents.
- Evaluate formulas.
- Use scientific notation.
- Perform addition, subtraction, and scalar multiplication on matrices.
- Apply order of operations to algebraic expressions.
- Use appropriate units in solutions to application problems.
- Convert units and use unit analysis with standard and metric systems.

### Geometry/Graphs

- Apply perimeter, area, circumference, surface area and volume formulas to common two-dimensional and three-dimensional figures.
- Understand and use the Pythagorean Theorem.
- Recognize the relationship between points on a graph and solutions to an equation.
- Determine the length of a line segment.
- Determine slope from the graph of a line or two points on a line.
- Recognize graphs of linear, quadratic, and absolute value equations.

- Graph both linear and non-linear equations and inequalities including the absolute value function and parabolas.
- Use graphing calculators to explore linear functions.

### **Probability**

- Construct sample spaces to illustrate all possible outcomes of events.
- Determine probability for simple and compound events.
- Use area models to represent probabilities.

### **Statistics**

- Analyze data and use information to make predictions.
- Construct and read tables, charts, and graphs.
- Determine measures of central tendency and dispersion.
- Use matrices to represent data.
- Estimate a line of best fit for a set of data.

### **Problem Solving**

- Use a variety of problem-solving strategies including:
  - - estimation
  - - systematic lists
  - - diagrams
  - - look for a pattern
  - - guess and check
  - - solve a similar, simpler problem.
- Use estimation to check the reasonableness of answers.
- Use symbolic notation to represent word problems as expressions, equations, and/or inequalities.
- Use graphing calculators to display data, graph and compare functions, and explore simple programming.
- Use computers with appropriate software to explore data and create spreadsheets.
- Select and use an appropriate method for computing: estimation, mental math, pencil and paper, or calculator/computer.

### **Algebra**

- Develop the language and vocabulary of algebra.
- Use union, intersection, and Venn diagrams to explore relationships among given sets.
- Use the properties of real numbers to simplify expressions and solve equations and inequalities.

- Solve linear equations and inequalities in one variable.
- Solve literal equations for a given variable.
- Use rules of exponents and radicals to simplify expressions.
- Add, subtract, multiply, and divide polynomials.
- Use a variety of techniques to factor and expand polynomial expressions.
- Simplify, add, subtract, multiply, and divide rational expressions.
- Simplify complex fractions.
- Solve problems involving ratio and proportion.
- Solve and graph systems of equations and inequalities.
- Solve and graph absolute value equations and inequalities.
- Solve compound sentences.
- Use both factoring and the quadratic formula to solve quadratic equations.
- Solve equations involving rational expressions and/or radicals.
- Use multiple representations (numeric, algebraic, graphic, and verbal) to illustrate a mathematical relationship.
- Write an equation for a line given its graph or a description of its graph or a set of data.
- Simplify expressions and/or equations that contain matrices.
- Develop the concept of functions including domain and range .
- Develop and use function notation.
- Recognize a pattern between two sets of numbers and develop a rule or function to express that relationship.

## **Geometry Content Standards**

### **Number Sense**

- Use estimation skills when sketching diagrams, including relative sizes of angles and segments.
- Determine limitations and boundaries of variables representing angles and lengths.
- Eliminate unreasonable solutions.
- Understand the number "**Pi**" and its relationship to circles, cylinders, and spheres.

### **Computation**

- Simplify expressions involving radicals and exponents.
- Simplify complex fractions when they appear in proportions and formulas.
- Evaluate formulas, including distance, midpoint, area, perimeter, volume, Pythagorean theorem, and quadratic formula.

- Set up and solve proportions related to similar figures.
- Use trigonometric ratios to compute measures of unknown parts of a right triangle.

### **Measurement**

- Measure angles using a protractor.
- Use a variety of methods for basic constructions and models (e.g. paper folding, compass, straight edge, protractor, technology).
- Use appropriate unit labels in solutions of application problems.

### **Theory**

- Develop the language and vocabulary of geometry.
- Understand the parts and structure of Euclidean Geometry (i.e. undefined terms, definitions, postulates/axioms, and theorems).
- Explore the importance of logical reasoning, justification and formal proof.
- Distinguish between Euclidean geometry and non-Euclidean geometry.
- Recognize and use coordinate geometry and transformational geometry.
- Understand the difference between inductive and deductive reasoning.

### **Deduction**

- Develop the language and vocabulary of geometry.
- Understand the parts and structure of Euclidean Geometry (i.e. undefined terms, definitions, postulates/axioms, and theorems).
- Explore the importance of logical reasoning, justification and formal proof.
- Distinguish between Euclidean geometry and non-Euclidean geometry.
- Recognize and use coordinate geometry and transformational geometry.
- Understand the difference between inductive and deductive reasoning.

### **Diagrams and Models**

- Identify, classify, and draw two-dimensional and three-dimensional geometric figures.
- Develop spatial relationships and concepts using models
- Investigate properties of triangles, quadrilaterals, and other polygons
- Investigate properties of circles
- Investigate properties of three-dimensional figures
- Investigate properties of geometric figures using appropriate technology and software

## Probability

- Construct a sample space illustrating all outcomes of a particular event
- Solve probability problems involving geometric models

## Patterns

- Understand the inequality relationships between the sides and angles of a triangle
- Identify and apply patterns from right triangles, including 30°-60°-90°, 45°-45°-90°, and Pythagorean triples, to application problems
- Identify and describe patterns that emerge from two-dimensional and three-dimensional geometric figures (e.g. Euler's formula for vertices, edges, and faces; altitudes and slant height of solids, etc.)
- Describe and apply transformations of geometric figures

## Algebra

- Develop and solve equations that model geometric relationships.
- Simplify and solve equations generated by formulas including distance, midpoint, and the Pythagorean Theorem.

## Optional/Enrichment

- History of Mathematics.
- Non-Euclidean Geometries.
- Mapping/Cartography.
- Tessellations, Escher-type designs, and fractals.

## Algebra II Content Standards

### Number Sense

1. Use estimation to check reasonableness of answers.
2. Select appropriate scales when graphing application problems.
3. Estimate line of best fit or curve of best fit for a given set of data.
4. Identify and use all subsets of the Complex Number System.
5. Restrict variables in algebraic expressions or equations, when necessary, to give a meaningful statement.
6. Determine reasonable domain and range when solving application problems.
7. Use appropriate unit labels in solutions of application problems.

## Geometry

- Accurately graph linear functions and quadratic functions.
- Use diagrams to illustrate algebraic relationships.
- Sketch the graphs of basic parent functions including linear, quadratic, exponential and logarithmic functions.
- Apply transformations to parent functions.
- Recognize and use asymptotes, holes, and axes of symmetry to describe a graph.
- Sketch graphs of the conic sections from their equations.
- Know and use coordinate geometry formulas.
- Describe the geometric interpretation of real zeros of a function.

## Statistics

- Read and interpret data displays.
- Organize and display data using stem-and-leaf plots, box-and-whisker plots, histograms, and scatter plots.
- Find a line of best fit for a given set of data using a variety of methods.
- Use a regression line to make predictions for a given set of data.
- Determine measures of central tendency and measures of dispersion for a given set of data.
- Interpret percentiles and percentile ranks for a given set of data
- Describe characteristics of a normal distribution.
- Analyze the validity of statistical conclusions applied to real-world situations.

## Probability

- Distinguish between combinations and permutations.
- Determine the sample space for an experiment.
- Calculate probabilities of simple and compound events.
- Calculate probabilities of mutually exclusive events.
- Solve problems involving conditional probabilities.
- Compare experimental probability with theoretical probability.

## Patterns

- Recognize and describe a rule for a sequence or series.
- Distinguish between types of sequences and series.
- Use a variety of techniques to expand and factor polynomial expressions.
- Develop and use Pascal's triangle and the Binomial theorem.
- Recognize direct and inverse variation and apply them to real-world situations.

## Algebra

- Expand the concepts of relations and functions.
- Explore discrete functions and piecewise functions.
- Perform operations on matrices.
- Simplify rational and irrational expressions.
- Solve problems that contain rational and irrational expressions.
- Simplify expressions with complex numbers.
- Solve quadratic equations.
- Solve equations having both real and imaginary solutions.
- Solve compound statements.
- Transform equations into various forms.
- Define conic sections and develop their properties algebraically and geometrically.
- Formulate and solve systems of equations in three unknowns.
- Develop and apply the remainder theorem and the factor theorem.
- Develop and apply the rational roots theorem.
- Develop and use synthetic division.
- Formulate and solve systems of inequalities using number lines and coordinate planes.
- Develop concepts involving sequences and series including partial sums, sigma notation, and sums of arithmetic, geometric, and infinite series.
- Develop concepts of exponential and logarithmic functions including their relationship to each other.
- Develop the properties of logarithms.
- Use functions to model real-world applications.
- Use appropriate technology to solve problems including graphing calculators, CBLs, and computers with appropriate software.