

## Pre-Algebra

State Standard Number	State Standard Area/Description	Unit Name	Course Topic Description
N	Number Sense, Properties, and Operations	Basics  Number Basics	Integer Math, Absolute Value, Exponents  Number Properties
N.1	The complex number system includes real numbers and imaginary numbers		
N.1.a	Show that between any two rational numbers there are an infinite number of rational numbers, and that between any two irrational numbers there are also an infinite number of irrational numbers		
N.1.b	Express the square root of a negative number using imaginary numbers		
N.2	Formulate, represent, and use algorithms with real numbers flexibly, accurately, and efficiently		
N.2.a	Use appropriate computation methods that encompass estimation and calculation		
N.2.b	Use technology to perform operations (addition, subtraction, multiplication, and division) on numbers written in scientific notation		
N.2.c	Describe factors affecting take-home pay and calculate the impact		
N.2.d	Design and use a budget, including income (net take-home pay) and expenses (mortgage, car loans, and living expenses) to demonstrate how living within your means is essential for a secure financial future		
N.3	Systematic counting techniques are used to describe and solve problems		

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N.3.a	Use combinatorics (Fundamental Counting Principle, permutations and combinations) to solve problems in real-world contexts		
P	Patterns, Functions, and Algebraic Structures		
P.1	Functions model situations where one quantity determines another and can be represented algebraically, graphically, and using tables		
P.1.a	Determine when a relation is a function using a table, a graph, or an equation		
P.1.b	Demonstrate the relationship between all representations of linear functions using point-slope, slope-intercept, and standard form of a line		
P.1.c	Represent linear, quadratic, absolute value, power, exponential, logarithmic, rational, trigonometric (sine and cosine), and step functions in a table, graph, and equation and convert from one representation to another		
P.1.d	Determine the inverse (expressed graphically or in tabular form) of a function from a graph or table		

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P.1.e	Categorize sequences as arithmetic, geometric, or neither and develop formulas for the general terms related to arithmetic and geometric sequences	Geometric Concepts and Proportions	Arithmetic Sequences
P.2	Graphs and tables are used to describe the qualitative behavior of common types of functions		
P.2.a	Evaluate a function at a given point in its domain given an equation (including function notation), a table, and a graph		
P.2.b	Identify the domain and range of a function given an equation (including function notation), a table, and a graph		
P.2.c	Identify intercepts, zeros (or roots), maxima, minima, and intervals of increase and decrease, and asymptotes of a function given an equation (including function notation), a table, and a graph		
P.2.d	Make qualitative statements about the rate of change of a function, based on its graph or table		
P.3	Parameters influence the shape of the graphs of functions		
P.3.a	Apply transformations (translation, reflection, dilation) to a parent function, $f(x)$		
P.3.b	Interpret the results of these transformations verbally, graphically, and symbolically		
P.4	Expressions, equations, and inequalities can be expressed in multiple, equivalent forms	Word Problems	Translating English to Math, Strategies
P.4.a	Perform and justify steps in generating equivalent expressions by identifying properties used including the commutative,	Number Basics	Number Properties

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	associative, inverse, identity, and distributive properties		
P.4.b	Apply the properties of positive and negative rational exponents to generate equivalent algebraic expressions including those involving $n$ th roots		
P.4.c	Solve equations for one variable in terms of the others		
P.5	Solutions to equations, inequalities and systems of equations are found using a variety of tools		
P.5.a	Find solutions to quadratic and cubic equations and inequalities by using appropriate algebraic methods such as factoring, completing the square, graphing or using the quadratic formula		
P.5.b	Find solutions to equations involving power, exponential, rational and radical functions		
P.5.c	Solve systems of linear equations and inequalities with two variables		
P.6	Quantitative relationships in the real world can be modeled and solved using functions		
P.6.a	Represent, solve, and interpret problems in various contexts using linear, quadratic, and exponential function		
P.6.b	Represent, solve, and interpret problems involving direct and inverse variations and a combination of direct and inverse variation		
P.6.c	Analyze the impact of interest rates on a personal financial plan		
P.6.d	Evaluate the costs and benefits of credit		
P.6.e	Analyze various lending sources, services, and financial institutions		
D	Data Analysis, Statistics, and Probability	Probability & Data Analysis	Probability, Data Analysis Projects
D.1	Statistical methods take variability into account, supporting informed decision-making through quantitative studies designed to		

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	answer specific questions		
D.1.a	Formulate appropriate research questions that can be answered with statistical analysis		
D.1.b	Determine appropriate data collection methods to answer a research question		
D.1.c	Explain how data might be analyzed to provide answers to a research question		
D.2	The design of an experiment or sample survey is of critical importance to analyzing the data and drawing conclusions		
D.2.a	Identify the characteristics of a well-designed and well-conducted survey		
D.2.b	Identify the characteristics of a well-designed and well-conducted experiment		
D.2.c	Differentiate between the inferences that can be drawn in experiments versus observational studies		
D.3	Visual displays and summary statistics condense the information in data sets into usable knowledge	Probability and Data Analysis	Probability
D.3.a	Identify and choose appropriate ways to summarize numerical or categorical data using tables, graphical displays, and numerical summary statistics (describing shape, center and spread) and accounting for outliers when appropriate	Probability and Data Analysis	Probability
D.3.b	Define and explain how sampling distributions (developed through simulation) are used to describe the sample-to-sample variability of sample statistics		
D.3.c	Describe the relationship between two categorical variables using percents		
D.3.d	When the relationship between two numerical variables is reasonably linear, apply the least-squares criterion for line fitting, use		

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	Pearson's correlation coefficient as a measure of strength, and interpret the slope and y-intercept in the context of the problem		
D.4	Randomness is the foundation for using statistics to draw conclusions when testing a claim or estimating plausible values for a population characteristic		
D.4.a	Define and explain the meaning of significance (both practical and statistical)		
D.4.b	Explain the role of p-values in determining statistical significance		
D.4.c	Determine the margin of error associated with an estimate of a population characteristic		
D.5	Probability models outcomes for situations in which there is inherent randomness, quantifying the degree of certainty in terms of relative frequency of occurrence		
D.5.a	Develop simulations that demonstrate probability as a long-run relative frequency		
D.5.b	Apply and solve problems using the concepts of independence and conditional probability		
D.5.c	Apply and solve problems using the concept of mutually exclusive properties when combining probabilities		
D.5.d	Evaluate and interpret probabilities using a normal distribution		
D.5.e	Find and interpret the expected value and standard deviation of a discrete random variable X		
D.5.f	Analyze the cost of insurance as a method to offset the risk of a situation		
S	Shape, Dimension, and Geometric Relationships	Basic Geometry	Geometric Formulas, Three Dimensional Measurements
S.1	Attributes of two- and three-dimensional objects are measurable and can be quantified	Basic Geometry	Geometric Formulas, Three Dimensional Measurements

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S.1.a	Calculate (or estimate when appropriate) the perimeter and area of a two-dimensional irregular shape		
S.1.b	Justify, interpret, and apply the use of formulas for the surface area, and volume of cones, pyramids, and spheres including real-world situations		
S.1.c	Solve for unknown quantities in relationships involving perimeter, area, surface area, and volume		
S.1.d	Apply the effect of dimensional change, utilizing appropriate units and scales in problem-solving situations involving perimeter, area, and volume		
S.2	Objects in the plane and their parts, attributes, and measurements can be analyzed deductively		
S.2.a	Classify polygons according to their similarities and differences		
S.2.b	Solve for unknown attributes of geometric shapes based on their congruence, similarity, or symmetry		
S.2.c	Know and apply properties of angles including corresponding, exterior, interior, vertical, complementary, and supplementary angles to solve problems. Justify the results using two-column proofs, paragraph proofs, flow charts, or illustrations		
S.2.d	Develop conjectures and solve problems about geometric figures including definitions and properties (congruence, similarity, and symmetry). Justify these conjectures using two-column proofs, paragraph proofs, flow charts, or illustrations		
S.3	Objects in the plane can be transformed, and those transformations can be described and analyzed mathematically	Geometric Concepts and Proportions	Geometric Concepts
S.3.a	Make conjectures involving two-dimensional objects represented with Cartesian coordinates. Justify		

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	these conjectures using two-column proofs, paragraph proofs, flow charts, and/or illustrations		
S.3.b	Represent transformations (reflection, translation, rotation, and dilation) using Cartesian coordinates	Geometric Concepts and Proportions	Geometric Concepts
S.3.c	Develop arguments to establish what remains invariant and what changes after a transformation (reflection, translation, rotation, and dilations). Justify these conjectures using two-column proofs, paragraph proofs, flow charts, and/or illustrations		
S.3.d	Using construction tools, including technology, make conjectures about relationships among properties of shapes in the plane including those formed through transformation. Justify these conjectures using two-column proofs, paragraph proofs, flow charts, and/or illustrations		
S.4	Right triangles are central to geometry and its applications	Basic Geometry	Geometric Formulas
S.4.a	Apply right triangle trigonometry (sine, cosine, and tangent) to find indirect measures of lengths and angles		
S.4.b	Apply the Pythagorean theorem and its converse to solve real-world problems	Basic Geometry	Geometric Formulas
S.4.c	Determine the midpoint of a line segment and the distance between two points in the Cartesian coordinate plane		