NUMBER SENSE (NS)	Standard	Core Concepts	Key terms	Examples
MA.PA.NS.1.	Read, write, compare and solve problems using decimals in scientific notation.	• Rational numbers can be written in different forms. • Very large and very small numbers can be expressed as a product of a power of 10.	• Scientific notation	
MA.PA.NS.2	Understand that computations with an irrational number and a rational number (other than zero) produce an irrational number.	• Mathematicians look for patterns and represent them with rules. • In order to evaluate numerical expressions, you must use order of operations. • Rational numbers can be written in different forms.	• rational numbers • irrational numbers	
MA.PA.NS.3	Understand and evaluate negative Integer exponents.	• Rules of exponents are applied to simplify expressions and equations. • Negative exponents can be written as the reciprocal of the original fraction/number.	• real numbers • integers • whole numbers • natural numbers	

NUMBER SENSE (NS)	Standard	Core Concepts	Key terms	Examples
MA.PA.NS.4	Use the laws of exponents for integer exponents.	• Rules of exponents are applied to simplify expressions and equations.		
MA.PA.NS.5	Calculate and find approximations of square roots.	• An estimation can be as useful as an exact number.. • The product of two of the same number is a square. • The inverse operation of squaring a number is the square root of a number.	• square root	

COMPUTATION (C)	Standard	Core Concepts	Key terms	Examples
MA.PA.C.1	Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) in multi-step problems.	• Adding integers involved grouping or cancelling. • Subtracting integers is the same as adding the opposite. • If the numbers of positive integers is even (odd), the product is positive (negative). • If any integer is zero, the product is zero. • The rules for dividing integers are the same as multiplying integers.		
MA.PA.C.2	Solve problems by computing simple and compound interest.	• Simple and compound interest is calculated by finding percents of a number. • Percents can be found using proportional relationships between numbers. • Cross-products can be used to solve proportions. • A percent is a ratio with a denominator of 100.	• simple interest • compound interest	

COMPUTATION (C)	Standard	Core Concepts	Key terms	Examples
MA.PA.C.3	Use estimation techniques to decide whether the answers to computations on a calculator are reasonable.	• An estimation can be as useful as an exact number.		
MA.PA.C.4	Use mental arithmetic to compute with common fractions, decimals, powers, and percents.			

ALGEBRA AND FUNCTIONS (AF)	Standard	Core Concepts	Key terms	Examples
MA.PA.AF.1	Write and solve multi-step linear equations and inequalities including variables on each side.	• You can use the Commutative, Associative, and Distributive properties to evaluate expressions. • Variables represent unknown numbers that can be solved for, with sufficient information. • Inverse operations are used to simplify equations. • Inequalities use mathematical symbols to compare expressions.	• inequalities • expression • equation • variables	
MA.PA.AF.2	Interpret the solution(s) of the results of linear equations and inequalities in one variable in their context, verifying the reasonableness of the results.	• Equations can have no solution, one solution or multiple solutions. • Inequalities can have no solution or multiple solutions. • Real world problems can be analyzed or solved using an expression or equation.		

ALGEBRA AND FUNCTIONS (AF)	Standard	Core Concepts	Key terms	Examples
MA.PA.AF.3	Solve systems of linear equations using the substitution method and identify approximate solutions graphically.	• Two proportional relationships can be compared using a system of equations. • Linear systems can be solved using the graphing, substitution, and elimination methods.	• system of linear equations • substitution • elimination	
MA.PA.AF.4	Interpret positive integer powers as repeated multiplication and negative integer powers as repeated division or multiplication by the multiplicative inverse.	• You can use exponents to write repeated multiplication.	• multiplicative inverse	
MA.PA.AF.5	Use the correct order of operations to find the values of algebraic expressions involving powers.	• In order to evaluate numerical expressions, you must use order of operations.	• slope • linear equation	

ALGEBRA AND FUNCTIONS (AF)	Standard	Core Concepts	Key terms	Examples
MA.PA.AF.6	Identify and graph linear functions, and identify lines with positive and negative slope.	• A function is a relationship pairing each input value with exactly one output value. • Relations and functions can be numerically, graphically, algebraically, and verbally. • Linear functions represent situations with a constant rate of change (slope).		
MA.PA.AF.7	Find the slope of a linear function given the equation and write the equation of a line given the slope and any point on the line.	• A function expresses a relationship between an input and its only output. Lines are an example of functions. • Equations of lines can be written in standard form, point-slope form, and slope-intercept form.	• standard form of a linear equation • slope-intercept form • point-slope form	

ALGEBRA AND FUNCTIONS (AF)	Standard	Core Concepts	Key terms	Examples
MA.PA.AF.8	Demonstrate an understanding of rate as a measure of one quantity with respect to another quantity.	• Functions can be manipulated like other algebraic equations- by replacing a representation of a value with the value. • Many real-world situations can be represented using linear models.		
MA.PA.AF.9	Demonstrate an understanding of the relationships among tables, equations, verbal expressions, and graphs of linear functions.	• Function tables can be used to organize inputs and outputs. • Linear relationships can be expressed as tables, equations, verbal expressions, and graphs.		
MA.PA.AF.10	Identify functions as linear or non-linear and examine their characteristics in tables, graphs, and equations.	• Non-linear functions have a graph that is not a line or part of a line.		

GEOMETRY (G)	Standard	Core Concepts	Key terms	Examples
MA.PA.G.1	Identify and describe basic properties of geometric shapes: altitudes, diagonals, angle bisectors, perpendicular bisectors, central angles, radii, diameters, and chords of circles.	• All constructions are based on properties of geometric figures. • Two- and three-dimensional objects can be described, classified, and analyzed by their attributes. • Angle and side measurements are used in classifying shapes. • Various aspects of geometric figures can be measured and calculated using algebra. • Formulas for calculating key aspects of geometric figures can be developed by using existing knowledge of the shapes.	• bisector • perpendicular • parallel • radius • diameter • chords	
MA.PA.G.2	Perform simple constructions such as bisectors of segments and angles, copies of segments and angles, and perpendicular segments. Describe and justify the constructions.	• Rulers, protractors, and compasses can be used to create segments and angles.	• lines • line segment	

GEOMETRY (G)	Standard	Core Concepts	Key terms	Examples
MA.PA.G.3	Identify properties of three-dimensional geometric objects (e.g., diagonals of rectangular solids) and describe how two or more figures intersect in a plane or in space.	• All constructions are based on properties of geometric figures. • Geometry and spatial sense offer ways to visualize, to interpret, and to reflect on our physical environment.		
MA.PA.G.4	Understand coordinate graphs using them to plot simple shapes and find images under translations (slide), rotations (turns), reflections (flips) and dilation (stretches & shrinks).	• The coordinate plane can be used to rotate, reflect, dilate, and translate polygons.	• translation • rotation • reflection • dilation	
MA.PA.G.5	Use the Pythagorean Theorem and its converse to solve problems in two and three dimensions.	• The Pythagorean Theorem is a tool for analyzing triangles. • Relationships exist in triangles that simplify solving for similarity. • The Pythagorean Theorem has extensive real-world applications, many involving distance. • You can indirectly measure distance using the Pythagorean Theorem.	• Pythagorean Theorem • hypotenuse	

MEASUREMENT (M)	Standard	Core Concepts	Key terms	Examples
MA.PA.M.1	Convert common measurements for length, area, volume, weight, capacity, and time to equivalent measurements within the same system.	• Unit rates are used to convert between unit measures. • Proportional relationships can be used to convert between unit measures. • Rates are ratios of two quantities with different units.		
MA.PA.M.2	Solve simple problems involving rates and derived measurements for such attributes as velocity and density.	• Unit rates are useful for comparisons. • Cross-products can be used to solve proportions.		
MA.PA.M.3	Solve problems involving scale factors, area, and volume using ratio and proportion.	• Cross-products can be used to solve proportions. • You can use ratios to find equivalent rates and unit rates.		

MEASUREMENT (M)	Standard	Core Concepts	Key terms	Examples
MA.PA.M.4	Use formulas for find the perimeter and area of basic two-dimensional shapes and the surface area and volume of basic three-dimensional shapes, including rectangles, parallelograms, trapezoids, triangles, circles, prisms, cylinders, spheres, cones, and pyramids.	• Formulas can be used to calculate area, perimeter, surface area, and volume of basic two- and three-dimensional shapes. • Surface area is the sum of all the areas of all the shapes that cover the surface of an object. • Volume is the number of cubes required to fill the object. It is measured in cubic units.		
MA.PA.M.5	Estimate and compute the area and volume of irregular two- and three-dimensional shapes by breaking the shapes down into more basic geometric objects.	• Formulas for calculating key aspects of geometric figures can be developed by using existing knowledge of the shapes. • Various aspects of geometric figures can be measured and calculated using algebra.		

DATA ANALYSIS AND PROBABILITY (DP)	Standard	Core Concepts	Key terms	Examples
MA.PA.DP.1	Identify claims based on statistical data and, in simple cases, evaluate the reasonableness of the claims. Design a study to investigate the claim.	• All data and statistics are biased. Data can be biased by many different elements, including questions and sampling methods. Bias comes from many different sources, and is inherent in human work. • Actual outcomes may not match mathematically predicted outcomes.		
MA.PA.DP.2	Identify different methods of selecting samples, analyzing the strengths and weaknesses of each method, and the possible bias in a sample or display.	• Populations can be represented by samples. • Data representations can give information on data. • The way that data is collects, organized, and displayed influences interpretation.		

DATA ANALYSIS AND PROBABILITY (DP)	Standard	Core Concepts	Key terms	Examples
MA.PA.DP.3	Analyze, interpret, and display single- and two-variable data in appropriate bar, line and circle graphs, stem-and-leaf plots and box-and-whisker plots, and explain which types of display are appropriate for various data sets.	• Data representations can give information on data. • some ways of representing data are more effective than others for different data and/or results.		
MA.PA.DP.4	Represent two-variable data with a scatterplot on the coordinate plane and describe how the data points are distributed. If the pattern appears to be linear, draw a line that appears to best fit the data, and write the equation of that line.	• Scatterplots represent trends in data-these trends can be positive, negative, or neutral.	• scatterplot • correlation • line of best fit	
MA.PA.DP.5	Understand and recognize equally likely events.	• The probability of an event occurring can often be determined mathematically. • Probability explains how things		

		will tend to act over many trials.		

DATA ANALYSIS AND PROBABILITY (DP)	Standard	Core Concepts	Key terms	Examples
MA.PA.DP.6	Find the number of possible arrangements of several objects by using the Basic Counting Principle.	• The Basic Counting Principle states that when there are m ways to do one thing, and n ways to do another, there are m x n ways of doing both.		
MA.PA.DP.7	Describe the difference between combinations and permutations and their impact on the possible arrangements of several objects.	• Permutations are for lists (order matters). • Combinations are for groups (order does not matter). • A permutation is an ordered combination.	• combinations • permutations	