

Grade	Strand	Anchor Standard	Code	Benchmark
6	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	6.1.1.01	Recognize a statistical question as one that anticipates variability in the data, compares differences between groups and collects categorical or numerical data related to the question, and accounts for it in the answer. (MP2) ✚
6	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	6.1.1.02	Design and conduct investigations and experiments to gather data, while considering cultural perspectives, to answer statistically investigative questions considering variability and justifying choice of variables. (MP3, MP6) ✚ \$ # ⚙
6	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	6.1.1.03	Identify, determine and interpret measures of center (mean and median) and measures of variability (range, interquartile range, mean-absolute deviation) to answer a statistically investigative question, summarizing the distribution of data using the measures of center and variability. (MP1, MP2) \$ μ
6	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	6.1.1.04	Create a visualization about a data set to describe patterns, highlight relationships or illustrate features of the distribution of the data to answer or help answer their statistically investigative question. Visualizations should represent the data in appropriate ways, including tables, dot plots, stem-and-leaf plots, histograms and box plots while incorporating any other relevant information that helps to tell a story about the data. (MP5, MP6) #

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6	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	6.1.1.05	Compare and communicate competing explanations for data trends observed, considering cultural perspectives and reasonable alternatives given the variability in findings. (MP3, MP6) ⚙
6	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	6.1.2.01	Determine the sample space (set of possible outcomes) for a given experiment. Sample space may be determined by the use of tree diagrams, tables or pictorial representations. (MP1) ⚙
6	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	6.1.2.02	Determine the theoretical probability of an event using the ratio between the size of the event and the size of the sample space. Represent probabilities as percentages, fractions and decimals between 0 and 1 inclusive. (MP4)
6	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	6.1.2.03	Calculate experimental probabilities from experiments where the theoretical probability is known, recognizing that there may be differences between theoretical and experimental probability. Represent the probabilities as percentages, fractions and decimals between 0 and 1 inclusive. Use experimental probabilities to make predictions when actual probabilities are unknown. (MP4) # ⚙
6	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	6.2.3.01	Calculate the measurements of the surface area of rectangular and triangular prisms using appropriate units. Justify the formulas used. Justification may involve decomposition, nets or other models. (MP1, MP3) ✚ # ⚙

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6	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	6.2.3.02	Calculate the measurement of the volume of prisms (including triangular and nonrectangular prisms) using appropriate units. Justify the formulas used. Justification may involve decomposition or other models. (MP1, MP7) ✚ # ⚙
6	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	6.2.3.03	Solve situations in various contexts involving conversion of time, weights, capacities, lengths and area within measurement systems using appropriate units. (MP4, MP5) ✚ ⚙
6	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	6.2.3.04	Estimate time, weights, capacities, lengths and dollar amounts using benchmarks in measurement systems with appropriate units. (MP1) ✚ \$ ⚙
6	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	6.2.3.05	Find the area of special quadrilaterals and polygons by composing into rectangles or decomposing into triangles and other shapes. Apply these techniques in contextual mathematical situations. (MP2, MP5) ⚙
6	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	6.2.4.01	Determine missing angle measures in a triangle using the fact that the sum of the interior angles of a triangle is 180° . Use models to illustrate this fact. (MP8, MP2) ✚ ⚙

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6	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	6.2.4.02	Decompose polygons into triangles to investigate the sum of the interior angles of polygons. (MP1, MP7) #
6	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	6.2.4.03	Draw polygons in the coordinate plane given coordinates for the vertices. Use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in contextual situations. (MP4, MP7) ✨
6	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	6.3.5.01	Use positive and negative numbers to describe quantities having opposite directions or values, represent quantities in contexts and explain the meaning of 0 in situations including credits/debits, temperature above/below zero, elevation above/below sea level and positive/negative electric charge. (MP4, MP5) + \$ ✨
6	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	6.3.5.02	Locate positive and negative rational numbers on a number line. Plot ordered pairs of positive and negative rational numbers on a coordinate grid. (MP4, MP6) \$
6	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	6.3.5.03	Interpret statements of inequality ($<$, $>$, $=$) as statements about the relative position of two numbers on a number line, including positive and negative rational numbers in various forms. (MP1) ✨ \$

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6	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	6.3.5.04	Factor whole numbers. Express a whole number as a product of prime factors with exponents. Identify a prime number as a whole number greater than one whose only factors are one and itself. (MP7, MP8)
6	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	6.3.5.05	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum or difference of two whole numbers, from 1 through 100, with a common factor as a multiple of a sum or difference of two whole numbers with no common factor. (MP2, MP8)
6	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	6.3.5.06	Understand the absolute value of a rational number as its distance from 0 on the number line. Interpret absolute value as magnitude for a positive or negative quantity in context. (MP4, MP7) \$
6	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	6.3.5.07	Estimate solutions to situations with whole numbers, fractions and decimals and use the estimates to assess the reasonableness of the results in the context of the situation. (MP2) + \$ ✖

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6	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	6.3.5.08	Multiply and divide fractions and mixed numbers using visual models to represent the situation leading towards generalizable algorithms. (MP2)
6	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	6.3.5.09	Solve mathematical situations requiring arithmetic, including multiplication and division, with decimals, fractions and mixed numbers, explaining the solution pathway. Interpret quotients in the context of the situation. (MP3, MP4) \$ μ ⚙
6	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	6.3.5.10	Solve situations using the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$ in context, including constant speed and unit pricing to make purchase decisions. (MP4) ⚙ \$ ⚙
6	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	6.3.5.11	Solve percent situations using visual models including tables of equivalent ratios, tape diagrams or double number lines. Apply concepts of percentage including discounts, markups, tips and commission. Situations can include identifying the part given a whole and the percentage, and identifying the percentage given the part and the whole. (MP4, MP7) ⚙ μ ⚙

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6	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	6.3.6.01	Generate equivalent numerical expressions involving positive rational numbers and justify why expressions are equivalent. (MP1, MP3)
6	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	6.3.6.02	Determine equivalences among fractions, decimals and percentages involving rational numbers. Convert between equivalent representations. (MP7) \$
6	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	6.3.6.03	Represent mathematical situations using expressions, equations and inequalities involving variables and positive rational numbers. (MP4) \$ ✖
6	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	6.3.6.04	Solve one-step equations, including equations of the form $x + p = q$ and $px = q$ for cases in which p , q and x are all positive rational numbers. Use number sense, properties of arithmetic and the idea of maintaining equality on both sides of the equation. Interpret a solution in the original context and assess the reasonableness of results. (MP3, MP4)
6	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	6.3.6.05	Identify and use ratios to compare quantities. Understand that comparing quantities using ratios is not the same as comparing quantities using subtraction. (MP1) \$ ✖
6	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	6.3.6.06	Solve ratio and rate situations, including mixtures and concentrations, by modeling with tables of equivalent ratios, tape diagrams, double number lines or equations. (MP4, MP7) ✚ μ ✖

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6	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	6.3.7.01	Use variables to represent two quantities in a situation that change in relationship to one another. Write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables and relate these to the equation. (MP2, MP8) ✚ \$ μ
7	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	7.1.1.01	Formulate statistical investigative questions with data collection, keeping cultural perspectives in mind, which compare differences between groups, require a sample of a population and use categorical and/or numerical data. (MP3, MP6) ✚ \$
7	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	7.1.1.02	Describe how statistics can be used to gain information about a population by examining a sample of the population. Explain how generalizations about a population are valid only when the sample is representative of that population and that random sampling tends to produce representative samples and support valid inferences. (MP2) ✚ ⚙
7	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	7.1.1.03	Make inferences using statistics about population parameters based on a random sample from that population. (MP3)

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7	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	7.1.1.04	Understand that a set of data collected to answer a statistical question has a distribution that can be described by its center, variability and overall shape. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. Justify the choice of measures of center and variability, the shape of the data distribution and the context in which the data were gathered. (MP1, MP7)
7	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	7.1.1.05	Create a visualization about a data set, organizing and presenting the data in appropriate ways, including in tables, circle graphs and histograms, and incorporating any other relevant information that helps to tell a story about the data. (MP5, MP6) # μ
7	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	7.1.1.06	Compare and communicate multiple explanations for data trends observed, considering reasonable alternatives given the variability in findings and sampling methods and cultural perspectives. (MP3, MP6)
7	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	7.1.2.01	Calculate probability as a fraction of sample space or as a fraction of area. Express probabilities as fractions, decimals and percentages. (MP2)
7	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	7.1.2.02	Approximate the probability of a chance event, where the theoretical probability is unknown, by collecting data and observing its long-run frequency. Represent the probabilities as percentages, fractions and decimals between 0 and 1 inclusive. Use approximate probabilities to make predictions when actual probabilities are unknown. (MP4) # $\odot$

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7	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	7.1.2.03	Recognize that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space where the compound event occurs. (MP1)
7	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	7.1.2.04	Represent sample spaces for compound events by decomposing the events using methods such as organized lists, tables and/or tree diagrams. For an event described in everyday language, identify the outcomes in the sample space that compose the event. (MP5) #
7	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	7.1.2.05	Design and use a simulation within a computational tool to generate frequencies for compound events. #
7	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	7.1.2.06	Find probabilities of compound events using organized lists, tables, tree diagrams and/or simulation via a computational tool. (MP5) # μ ⚙
7	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	7.2.3.01	Demonstrate an understanding of the proportional relationship between the diameter and circumference of a circle and that the unit rate (constant of proportionality) is π . (MP1, MP2) ⚙ ⚙
7	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	7.2.3.02	Calculate the circumference and area of circles to solve situations in various contexts. (MP4, MP6) ⚙ μ ⚙

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7	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	7.2.3.03	Calculate the arc length and area of sectors of circles (given the central angle) to solve situations in various contexts. (MP4, MP7) ✚ ⚙
7	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	7.2.3.04	Calculate the surface area and volume of cylinders. Justify the formulas used. (MP3, MP8) ✚ ⚙
7	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	7.2.4.01	Graph and describe translations and reflections of figures on a coordinate grid. Determine the coordinates of the vertices of the figure after the transformation. Describe the properties of congruency when performing translations and reflections. (MP8)
7	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	7.2.4.02	Describe the properties of similarity, distinguishing between similarity and congruency, compare geometric figures for similarity and determine scale factors. (MP1, MP6) ✚ ⚙
7	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	7.2.4.03	Apply scale factors, length ratios and area ratios to determine side lengths and areas of similar geometric figures. (MP5)

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7	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	7.2.4.04	Use proportional reasoning and ratios to solve situations involving scale drawings and conversions of measurement units. (MP2, MP4) ✚ \$ ✨
7	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	7.3.5.01	Know that every rational number can be written as the ratio of two integers and as a terminating or repeating decimal. Recognize that π is not rational but that it can be approximated by rational numbers such as $22/7$ and 3.14 . (MP8)
7	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	7.3.5.02	Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line. Recognize that the opposite of the opposite of a number is the number itself, such as $-(-3) = 3$. Recognize that 0 is its own opposite. (MP7)
7	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	7.3.5.03	Compare positive and negative rational numbers expressed in various forms including the symbols $<$, $>$, $=$, $\leq$ and $\geq$. (MP4) \$
7	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	7.3.5.04	Recognize subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference and apply this principle in contexts. (MP7, MP8) ✚ \$ ✨

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7	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	7.3.5.05	Create a budget using positive and negative rational numbers for an event and calculate what percentage of the total budget each category comprises. Justify choices of the allocation of the available resources. (MP1, MP4, MP5) ✚ \$ μ ☼
7	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	7.3.5.06	Solve mathematical situations involving adding, subtracting, multiplying and dividing positive and negative rational numbers that are integers, fractions and terminating decimals. Use efficient and generalizable procedures. Raise positive rational numbers to whole-number exponents. (MP4) \$ ☼
7	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	7.3.5.07	Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. (MP1, MP4) \$ ☼
7	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	7.3.6.01	Use properties of algebra to generate equivalent numerical and algebraic expressions containing rational numbers, grouping symbols and whole number exponents. Properties of algebra include associative, commutative and distributive laws. (MP1)
7	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	7.3.6.02	Represent and solve contextual situations resulting in two-step equations and inequalities involving variables and positive/negative rational numbers. Graph the solution set of the inequality and interpret the solution in context. (MP4, MP5) \$ ☼

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7	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	7.3.6.03	Evaluate algebraic expressions, including expressions containing rational numbers, absolute value and whole number exponents, by applying computational hierarchy of operations at specified values of their variables. (MP7) #
7	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	7.3.6.04	Solve multi-step situations involving proportional relationships in numerous contexts using models, such as tables of equivalent ratios involving scaling up and down, tape diagrams, double number lines or equations. (MP4, MP7) ✚ \$ μ ⚙
7	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	7.3.6.05	Solve multi-step financial literacy situations including simple interest, tax, markups and markdowns, tips and commissions, fees, percent increase and decrease and percent error. Distinguish between sales tax and income tax for earned wages. Situations include finding the whole, the part and the percent. (MP7, MP8) \$ μ ⚙
7	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	7.3.7.01	Represent proportional relationships with tables, verbal descriptions, symbols, equations and graphs. Translate from one representation to another. Determine the unit rate (constant of proportionality or rate of change) given any of these representations. (MP2, MP8) ✚ \$ μ
7	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	7.3.7.02	Express a relationship between two variables, the independent (x) and the dependent (y), as proportional if it can be written in the form $y/x = k$ or $y = kx$. Distinguish proportional relationships from non-proportional relationships, including relationships where the x and y value are not 0. (MP8) \$ ⚙

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7	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	7.3.7.03	Determine whether two quantities are in a proportional relationship by testing for equivalent ratios in a table or graphing on a coordinate plane and by observing whether the graph is a straight line through the origin. Use graphing technology to examine the relationship between the unit rate and the line for a given situation. (MP1) ✚ μ ⚙
8	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	8.1.1.01	Formulate statistical investigative questions, such as questions about variation, the differences between groups and associations between two numerical variables. (MP3) ✚
8	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	8.1.1.02	Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association and nonlinear association. (MP5, MP8)
8	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	8.1.1.03	Identify when to use straight lines to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line and assess the model fit by judging the closeness of the data points to the line. (MP5, MP6)
8	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	8.1.1.04	Use the equation of a linear model to solve situations in the context of bivariate measurement data. Interpret the slope and intercepts in context of the variables. (MP4, MP6) \$ #

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8	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	8.1.1.05	Create data visualizations about a data set. Organize and present the data in appropriate ways, including in tables and scatter plots, and incorporate other relevant information that helps to tell a story and support a claim about the data. (MP1, MP6) ✚ \$ # μ
8	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	8.1.1.06	Compare and communicate competing explanations for data trends observed, considering the reasonableness of the model's predictions and correlation versus causation. (MP3, MP6) \$ #
8	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	8.2.3.01	Informally justify the Pythagorean Theorem and its converse by using measurements, diagrams or computer software. (MP2, MP3) ✚ ⚙
8	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	8.2.3.02	Apply the Pythagorean Theorem to solve multi-step contextual situations by determining unknown side lengths in right triangles in both two- and three-dimensional shapes. (MP4) μ ⚙
8	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	8.2.3.03	Determine the distance between two points on a horizontal or vertical line in a coordinate system. Use the Pythagorean Theorem to find the distance between any two points in a coordinate system. (MP7) ✚ ⚙

Grade	Strand	Anchor Standard	Code	Benchmark
8	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	8.2.4.01	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane. Derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b . (MP8)
8	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	8.2.4.02	Given a line on a coordinate plane and the coordinates of a point not on the line, find lines through that point that are parallel and perpendicular to the given line, using graphing technology or hand drawn graphs. (MP7) ✚
8	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	8.2.4.03	Identify the different types of solutions possible for a system of linear equations (no solution, one solution, infinitely many solutions). Using slope, compare the number of solutions to the graphical representation of pairs of lines that are intersecting, parallel or identical. (MP2) §
8	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	8.3.5.01	Classify real numbers as rational or irrational. Know that when a square root of a positive integer is not an integer, then it is irrational. (MP1, MP7) ✎
8	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	8.3.5.02	Use rational approximations of irrational numbers to compare the size of irrational numbers and locate them approximately on a number line. Estimate the value of expressions involving irrational numbers. (MP2, MP6)

Grade	Strand	Anchor Standard	Code	Benchmark
8	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	8.3.5.03	Know and apply the properties of positive and negative integer exponents to generate equivalent numerical expressions. (MP1)
8	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	8.3.5.04	Express approximations of very large and very small numbers using scientific notation. Understand how technology displays numbers in scientific notation. Compare numbers expressed in scientific notation using the symbols $<$, $>$, $=$, $\leq$ and $\geq$. (MP4, MP5) \$ ⚙
8	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	8.3.5.05	Multiply and divide numbers expressed in scientific notation. Express answers in scientific notation. (MP5) \$ ⚙
8	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	8.3.5.06	Solve situations in various contexts involving calculating and comparing simple and compound interest. Compound interest situations are limited to compounded annually. (MP7, MP8) \$ ⚙

Grade	Strand	Anchor Standard	Code	Benchmark
8	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	8.3.5.07	Solve multi-step contextual situations comparing how interest rate and loan length affect the cost of credit. Calculate the total cost of repaying a loan under various rates of interest and over different periods of time. (MP4, MP5) ➕ \$ μ ⚙
8	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	8.3.5.08	Compare and contrast employment opportunities and their payment methods, including per hour, with or without tips, salary, per diem and piecework pay. Justify financial decisions with representations, including linear relationships. (MP1, MP4) ➕ \$ μ ⚙
8	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	8.3.6.01	Justify steps in generating equivalent algebraic expressions and identify the properties used. Properties include the associative, commutative, distributive, identity and inverse. (MP1, MP3)
8	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	8.3.6.02	Evaluate algebraic expressions, including expressions containing radicals and absolute values, by applying computational hierarchy of operations at specified values of their variables. (MP7)
8	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	8.3.6.03	Solve multi-step equations in one variable, including equivalent linear expressions. Solve for one variable in a multivariable equation in terms of the other variables. Justify the steps by identifying the properties of the equality used. (MP3, MP4)

Grade	Strand	Anchor Standard	Code	Benchmark
8	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	8.3.6.04	Use the relationship between square roots and squares of a number to solve situations. (MP2, MP6) ⚙
8	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	8.3.6.05	Represent linear relationships in point-slope and standard form and convert to slope-intercept form. (MP7)
8	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	8.3.6.06	Reason abstractly, involving variables as a point, slope or intercept, to compare general forms of linear relationships, including point-point, point-slope, standard form and slope-intercept form. (MP7) μ
8	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	8.3.6.07	Represent relationships in various contexts using multi-step linear inequalities. Solve linear inequalities using properties of inequalities. Graph the solutions on a number line and interpret the solutions in context. (MP4) \$ ⚙
8	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	8.3.6.08	Represent relationships in various contexts with equations and inequalities involving the absolute value of a linear expression. Solve such equations and inequalities and graph the solutions on a number line. (MP4) \$ ⚙
8	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	8.3.6.09	Represent relationships in various contextual situations using systems of linear equations. Solve systems of linear equations in two variables, symbolically and graphically, understanding that the solution corresponds to the point of intersection of their graphs. (MP4, MP5) \$ # ⚙

Grade	Strand	Anchor Standard	Code	Benchmark
8	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	8.3.7.01	Compare graphical properties of proportional and non-proportional linear relationships, including slope. (MP7) \$ ☼
8	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	8.3.7.02	Analyze visual patterns to distinguish between linear and non-linear patterns. For linear patterns, describe how a pattern is changing, name the n^{th} term and write an equation to generalize the n^{th} term. (MP1, MP7) ✚ # ☼
8	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	8.3.7.03	Recognize that a function is a rule that assigns each input to exactly one output. Use the function to represent the relationship in which changing the input (independent) variable, by an amount, leads to a change in the output (dependent) variable, a constant multiplied by that amount. Recognize that the graph of a function is the set of ordered pairs consisting of an input and the corresponding output. Use functional notation, such as $f(x)$, to represent such relationships. (MP4, MP7) μ
8	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	8.3.7.04	Represent linear functions with tables, verbal descriptions, symbols, equations and graphs. Translate from one representation to another. (MP5) \$ ☼
8	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	8.3.7.05	Explain how changes to the values m or b in the linear function $f(x) = mx + b$ affect the graph of the function. Use graphing technology to examine these effects. Recognize that the graph of the linear equation $y = mx + b$ comes from b units translation of $y = mx$ graph. (MP1, MP5) μ # ☼

Grade	Strand	Anchor Standard	Code	Benchmark
8	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	8.3.7.06	Identify graphical properties of linear functions in the form $f(x) = mx + b$, including slope, y-intercept and x-intercept. Know that the graph is a straight line, the slope (m) equals the rate of change, the y-intercept (b) is the value of the function at $x = 0$ and the x-intercept is the value of the function at $f(x) = 0$. (MP1, MP5) \$ ✨
8	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	8.3.7.07	Recognize that an arithmetic sequence is a linear function that can be expressed in the form $f(x) = mx + b$, where $x = 0, 1, 2, 3, \dots$ (MP1, MP8)
8	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	8.3.7.08	Recognize that a geometric sequence is a non-linear function that can be expressed in the form $f(x) = a(b)^x$, where $x = 0, 1, 2, 3, \dots$ (MP1, MP8)
8	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	8.3.7.09	Represent arithmetic and geometric sequences using equations, tables, graphs and verbal descriptions and use them to solve situations. (MP4)
9–11	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	9.1.1.01	Formulate statistical investigative questions and pose hypotheses. These include questions about variation or the differences between groups, associations between quantitative and categorical variables or pairing together multiple analyses. (MP1, MP3) ✚ \$ μ ✨
9–11	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	9.1.1.02	Explain how choices concerning data collection methods can affect the quality, size, speed, accessibility and cost of the data. (MP3) \$ ✨

Grade	Strand	Anchor Standard	Code	Benchmark
9–11	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	9.1.1.03	Analyze issues of bias by considering data collection methods and cultural perspectives. (MP3) ⚙
9–11	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	9.1.1.04	Explain the purposes of and differences among sample surveys, experiments and observational studies. Explain whether randomization in each allows for conclusions of causation and/or generalization of a population. (MP3) ⚙
9–11	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	9.1.1.05	Analyze and explain when arguments based on data confuse correlation and causation. (MP3)
9–11	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	9.1.1.06	Compute using technology or estimate the correlation coefficient of a linear model. Interpret the linear model in the context of the data. (MP5, MP6) \$
9–11	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	9.1.1.07	Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Identify data sets for which such a procedure is not appropriate. Tools can include calculators, spreadsheets, apps or tables. (MP5, MP6) \$ ⚙
9–11	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	9.1.1.08	Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples or simulated samples of the same size to gauge the variation in estimates or predictions. (MP1, MP4) # ⚙
9–11	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	9.1.1.09	Use statistics appropriate to the shape of the data distribution to compare the center and spread of two or more data sets. (MP4)

Grade	Strand	Anchor Standard	Code	Benchmark
9–11	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	9.1.1.10	Create and analyze data displays, including scatter plots, histograms and boxplots using technology. (MP1) ☼
9–11	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	9.1.1.11	Identify, create and compare statistical models with linear and exponential functions, including linear regression. Assess the reasonableness of model fit using residuals and correlation coefficients. (MP4) # μ
9–11	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	9.1.1.12	Examine and discuss competing explanations for data trends observed such as confounding variables. Respond to competing arguments or interpretations of the data of different community groups, paying careful attention to what conclusions the data supports. (MP3, MP6) \$ ☼
9–11	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	9.1.1.13	Analyze and interpret data using various measures, such as difference in shapes, center and spread to draw conclusions, identify trends and describe relationships, accounting for possible effects of extreme data points (outliers). (MP1) \$
9–11	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	9.1.1.14	Evaluate reports based on published data by identifying the source of the data, the design of the study and the way the data are analyzed and displayed. (MP3) \$ ☼
9–11	Data and Probability	Data Sciences: Identify, formulate and investigate statistical questions by collecting data, considering cultural perspectives, analyzing and interpreting data and communicating the results.	9.1.1.15	Identify and explain misleading uses of data along with how to use spreadsheets, tables or graphing technology to recognize and analyze distortions in data displays. Use interactive data visualizations to support and influence different points of view. (MP3) \$ #

Grade	Strand	Anchor Standard	Code	Benchmark
9–11	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	9.1.2.01	Select and apply counting procedures such as the multiplication and addition principles, permutations, combinations and tree diagrams to determine the elements and size of a sample space. (MP1, MP7)
9–11	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	9.1.2.02	Describe events as subsets of a sample space using characteristics of the outcomes. Use Venn diagrams, tables or lists to depict events and compute event sizes. Create representations to find unions, intersections and complements of events. (MP1) #
9–11	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	9.1.2.03	Apply probability concepts, such as intersections, unions and complements of events, and conditional probability and independence, to calculate probabilities and solve situations. (MP4) # ⚙
9–11	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	9.1.2.04	Calculate experimental probabilities by repeatedly performing simulations or experiments involving a probability model and by using relative frequencies of outcomes. Recognize that as the number of trials increases, the closer the experimental probability approaches the theoretical probability. (MP4)
9–11	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	9.1.2.05	Construct and interpret two-way frequency tables when two categories are associated with each object being classified. Use the two-way table to decide if events are independent and to calculate conditional probabilities. (MP4, MP5) ⚙

Grade	Strand	Anchor Standard	Code	Benchmark
9–11	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	9.1.2.06	Compare the recursion to create the n th row of Pascal's triangle, the recursion to expand $(x + y)^n$, the recursion to generate all sequences of heads and tails on n coin flips and the recursion to generate all subsets of a set with n elements. Establish connections among the various representations. (MP8)
9–11	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	9.1.2.07	Calculate and make decisions based on expected values using theoretical or experimental probabilities in scenarios, including finance or games of chance. (MP1, MP6) \$ μ ☼
9–11	Data and Probability	Chance and Uncertainty: Apply and explain the concepts of probability to interpret data, generate questions, predict and make informed decisions to solve problems and communicate ideas.	9.1.2.08	Calculate and make decisions to obtain a desired outcome (maximum or minimum value or maximum or minimum probability) based on expected value and theoretical or experimental probabilities in scenarios such as games of chance or finance. (MP6, MP7) \$ ☼
9–11	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	9.2.3.01	Apply the Pythagorean Theorem and distance formula to compute perimeters of polygons and areas of right triangles and rectangles on coordinate planes. (MP1) ☼
9–11	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	9.2.3.02	Apply properties of 45°-45°-90° and 30°-60°-90° triangles to solve situations and logically justify results. (MP1, MP4) ☼

Grade	Strand	Anchor Standard	Code	Benchmark
9–11	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	9.2.3.03	Use trigonometric ratios and the Pythagorean Theorem and its converse to solve contextual situations, including right triangles or polygons that can be decomposed into triangles. (MP4, MP7) ✨
9–11	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	9.2.3.04	Develop, justify and use decomposition to determine the formula for surface area and volume of various three-dimensional figures. (MP7, MP8) ✨ # ✨
9–11	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	9.2.3.05	Use the formulas for surface area and volume of various three-dimensional figures to solve multi-step contextual situations. (MP4, MP5) ✨ ✨
9–11	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	9.2.3.06	Use units of measure and dimensional analysis to solve multi-step situations. Interpret units consistently in formulas. Interpret the scale and the origin in graphs and data displays. (MP1, MP4) ✨ \$ ✨

Grade	Strand	Anchor Standard	Code	Benchmark
9–11	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	9.2.3.07	Compute the unit cost and total cost to cover different areas and volumes in applications, such as painting, carpeting and gardening. Optimize costs for various models, including linear and quadratic. Use technology, including spreadsheets. (MP4, MP5) μ ✱
9–11	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	9.2.3.08	Use similarity to determine the side ratios in right triangles as properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. (MP8)
9–11	Spatial Reasoning	Measurement: Investigate measurement using a variety of tools, units, systems, processes and techniques in various cultures. Explain and reason with attributes, estimations and formulas to communicate measurement(s) and relationships effectively. Justify decisions and consider the reasonableness of the measurement.	9.2.3.09	Apply dilations of scale factor k on length, area and volume and recognize the effect is multiplication by k , k^2 , k^3 respectively. (MP2) μ ✱
9–11	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	9.2.4.01	Apply properties of angles, including corresponding, exterior, interior, vertical, complementary and supplementary angles, to solve situations and logically justify results. (MP1, MP3)
9–11	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	9.2.4.02	Apply properties of equilateral, isosceles and scalene triangles to solve situations and logically justify results. (MP1, MP3) $\oplus$ ✱

Grade	Strand	Anchor Standard	Code	Benchmark
9–11	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	9.2.4.03	Apply properties such as interior and exterior angles and parallel and perpendicular sides to define, classify and solve situations involving regular and irregular polygons. (MP1) ✚ ⚙
9–11	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	9.2.4.04	Apply properties of congruent figures to solve situations and logically justify results. (MP1, MP3) ✚ ⚙
9–11	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	9.2.4.05	Accurately interpret and use words and phrases such as “if ... then,” “if and only if,” “all” and “not.” Recognize the logical relationships between an “if ... then” statement and its inverse, converse and contrapositive. (MP6, MP7) ✚ # ⚙
9–11	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	9.2.4.06	Analyze the validity of a logical argument and give counterexamples to disprove a statement. (MP1, MP3) ✚ # ⚙
9–11	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	9.2.4.07	Construct logical arguments using axioms, definitions, theorems and postulates that clearly justify the reasoning. (MP3, MP6) #
9–11	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	9.2.4.08	Identify, describe and solve situations using relationships among inscribed angles, circumscribed angles, radii and chords in circles. (MP5) ✚ ⚙

Grade	Strand	Anchor Standard	Code	Benchmark
9–11	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	9.2.4.09	Describe and solve situations using the relationships of angles formed outside the circle for both secants and tangent lines. (MP7) ✧
9–11	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	9.2.4.10	Apply properties of similar figures to solve situations and logically justify results. (MP3) ✚
9–11	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	9.2.4.11	Show that two triangles are similar using the AA, SAS and SSS similarity criteria. (MP7)
9–11	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	9.2.4.12	Make geometric constructions with a variety of tools, including dynamic geometric technology, to examine theorems, make and test conjectures, represent transformations and develop mathematical reasoning skills in multi-step situations. (MP5) ✧
9–11	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	9.2.4.13	Create and compare rigid and non-rigid transformations, and connect the preimage and image to congruence. (MP2)
9–11	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	9.2.4.14	Describe the steps used to show various sequences of transformations, applying reflections, rotations, translations and/or dilations of geometric figures that map one figure onto the other. (MP8) ✚ #

Grade	Strand	Anchor Standard	Code	Benchmark
9–11	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	9.2.4.15	Apply geometric methods to solve design situations, including designing an object or structure to satisfy physical constraints or optimize resources. (MP4) \$ μ
9–11	Spatial Reasoning	Geometry: Analyze characteristics of geometric shapes to make mathematical arguments and justifications about geometric relationships. Use visualization and geometric modeling to compare, solve problems and communicate ideas.	9.2.4.16	Apply concepts of density based on area and volume in modeling contextual situations, including population density, BTUs per cubic foot and data storage. (MP4) ✨
9–11	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	9.3.5.01	Add, subtract, multiply and divide numbers in scientific notation. (MP6, MP7) ✨ ✨
9–11	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	9.3.5.02	Compare the definition of rational exponents and properties of radicals. Explain how the definition of rational exponents follows from extending the properties of integer exponents, allowing for a notation for radicals in terms of rational exponents. (MP6)
9–11	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	9.3.5.03	Apply knowledge of number systems extending from whole numbers to integers, from integers to rational numbers, from rational numbers to real numbers and from real numbers to complex numbers to solve equations. (MP2, MP7)

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9–11	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	9.3.5.04	Use matrices to represent and manipulate data and interpret the results in context. Add, subtract and multiply matrices of appropriate dimensions. Multiply matrices by scalars. (MP4, MP5) #
9–11	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	9.3.5.05	Estimate and verify the cost of an item, including multiple discounts and taxes. Show an understanding of the order of operations. (MP6, MP8) \$
9–11	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	9.3.5.06	Assess the reasonableness of a solution in its given context, including financial literacy applications. Compare the solution to appropriate graphical or numerical estimates. Interpret a solution in the original context. (MP3) \$ ✱
9–11	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	9.3.5.07	Use the structure of an expression, equation and/or formula to create an equivalent form that is more helpful given the situation. Rearrange formulas to highlight a quantity of interest, using the same reasoning in solving equations. (MP6) \$

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9–11	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	9.3.5.08	Use the structure of an expression to write it in multiple ways. (MP7)
9–11	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	9.3.5.09	Find and evaluate the composition of multiple functions. (MP7)
9–11	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	9.3.5.10	Compute the time it takes to pay off a loan given the interest rate, loan amount and monthly payment. Determine the change in cost by the variation in loan amount, fixed or variable interest rates and payment amounts. Use technology, including spreadsheets. (MP1, MP5) ➕ \$ ⚙
9–11	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	9.3.5.11	Compute the total payments to pay off a loan given the interest rate, loan amount and monthly payment. Compare the total payments for various monthly payments and various interest rates. Use technology, including spreadsheets. (MP1, MP5) ➕ \$ ⚙

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9–11	Patterns and Relationships	Number Relationships: Describe, Interpret and use quantities, relationships between quantities, representations of quantities, and number systems. Describe operations and the relationship between operations. Use strategies and procedures accurately, efficiently and flexibly. Assess the reasonableness of the results.	9.3.5.12	Compare different types of retirement plans, considering after tax or pretax contributions, employer match contributions, the benefit of starting contributions early and the consequences of use prior to retirement. (MP1) \$
9–11	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	9.3.6.01	Add, subtract and multiply polynomials. (MP1, MP7)
9–11	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	9.3.6.02	Reason abstractly to compare general forms of quadratics, including vertex form, general form, factored form and the graph. Develop procedures to convert from one form to another. (MP2, MP7) μ
9–11	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	9.3.6.03	Choose and produce an equivalent form of a quadratic function, using symbolic and graphical methods, to identify the vertex, line of symmetry and intercepts of the parabola. (MP8)
9–11	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	9.3.6.04	Factor polynomials including common monomial factors from polynomials, quadratic polynomials and the difference of two squares. (MP7, MP8)
9–11	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	9.3.6.05	Solve quadratic equations by appropriate methods using factoring, completing the square, graphing or the quadratic formula. Find non-real complex roots when they exist. (MP2, MP7)

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9–11	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	9.3.6.06	Compare the equation of a circle, the Pythagorean Theorem and the Distance Formula. Complete the square to find the center and radius of a circle given an equation. (MP2, MP8)
9–11	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	9.3.6.07	Solve situations involving relationships which are inversely proportional in various contexts, including rates. (MP4) ✚ \$ ✎
9–11	Patterns and Relationships	Equivalence and Relational Thinking: Use concepts and properties of equivalence and relational thinking to represent and compare numerical expressions, proportional relationships, algebraic expressions and equations.	9.3.6.08	Apply the properties of rational exponents and radicals to generate equivalent algebraic expressions. (MP2, MP7)
9–11	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	9.3.7.01	Represent and solve situations in various contexts, including financial literacy, using systems of linear equations, systems of linear inequalities and exponential and quadratic functions. (MP4) \$ # ✎
9–11	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	9.3.7.02	Translate between graphs of quadratic, exponential and other functions (including absolute value, rational and polynomial), tables and symbolic representations. Sketch graphs and use graphing technology to graph functions. (MP5) \$
9–11	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	9.3.7.03	Determine how vertical/ horizontal reflecting, translating and scaling affect the symbolic and graphical forms of a function. Use graphing technology to examine transformations. (MP3)

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9–11	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	9.3.7.04	Express the terms in an arithmetic or geometric sequence recursively and by giving an explicit formula. (MP8) #
9–11	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	9.3.7.05	Express recursive patterns using recursive formulas. Calculate sequences defined by recursive formulas. (MP8) \$
9–11	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	9.3.7.06	Find the domain and range of functions defined symbolically, graphically or in a context, including piecewise and step functions. Express solutions and recognize that some answers obtained may not be valid, including cases where the function inputs are discrete instead of continuous. (MP4) ✚ \$ ⚙
9–11	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	9.3.7.07	Describe the graph of a function using key features such as intercepts, maxima/minima, intervals of increase and decrease and end behavior. Draw conclusions from graphs of functions and other relations. (MP3) \$ ⚙
9–11	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	9.3.7.08	Define the compounding of interest n times per year according to a recursive formula. Compare the recursive definition of interest to the recursive definition of a geometric sequence $t(n) = r(t(n-1))$. Compare the interest formula $A = P(1 + r/n)^{nt}$ to the general form of an exponential function $y = a(b)^x$. Explain the purpose of each part of the interest formula. (MP4, MP5) \$ # μ

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9–11	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	9.3.7.09	Find the inverse of a given function and justify the results using tables, graphs or algebra. (MP4, MP6)
9–11	Patterns and Relationships	Patterns and Relationships: Represent and connect mathematical patterns and relationships using verbal descriptions, generalizations, tables and graphs. Use representations to generate questions, make predictions and solve mathematical problems.	9.3.7.10	Use the concept of a function as a connection between inputs and outputs to find function values and use function notation. (MP2)