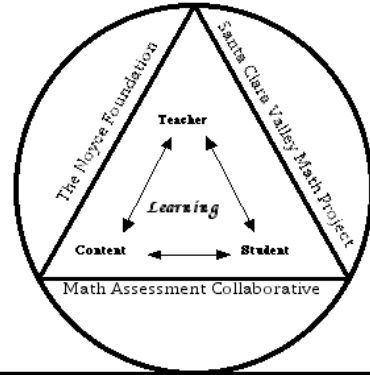


*Mathematics
Assessment
Collaborative*



The Silicon Valley Mathematics Initiative

Core Idea Document

Grades K - 10

Core Ideas - Kindergarten

Core Idea 1: Number Properties

Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

- Count with understanding and recognize “how many” in a set of objects.
- Develop a sense of whole numbers and represent and use them in flexible ways.
- Develop understanding of the relative magnitude and position of whole numbers.
- Use multiple models to develop initial understandings of the base-ten number system.
- Connect number words and numerals to the quantities they represent, using various physical models and representations.

Core Idea 2: Number Operations

Understand the meanings of operations and how they relate to each other, make reasonable estimates, and compute fluently.

- Develop an understanding of the different meanings of addition and subtraction of whole numbers.
- Understand the effects of adding and subtracting whole numbers.
- Develop relationships within addition and subtraction combinations.
- Develop and use strategies to estimate.

Core Idea 3: Patterns, Functions, and Algebra

Understand patterns and use mathematical models to represent and to understand qualitative and quantitative relationships.

- Sort, classify, and order objects by size, number, and other properties.
- Recognize, describe, and extend patterns of sound, shape, or number.
- Model change qualitatively, such as students growing **taller** or the weather turning **colder**.

Core Idea 4: Geometry and Measurement

Students will recognize and use characteristics, properties, and relationships of two- and three-dimensional geometric shapes and apply appropriate techniques to determine measurements.

- Recognize attributes and/or parts of common two- and three-dimensional shapes.
- Sort, name, and compare common two-dimensional shapes (circle, triangle, rectangle).

- Compare the length, weight, and capacity of objects by making direct comparisons.
- Develop an understanding of the concepts of time (day, month, seasons).

Core Idea 5: Data Analysis

Students collect, organize, display, and interpret data about themselves and their surroundings.

- Collect information from class generated survey question.
- Represent data using concrete objects, pictures, Venn diagrams and picture graphs.
- Compare parts of the data and the set of data as a whole to determine what the data shows.

Core Ideas - First Grade

Core Idea 1: Number Properties

Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

- Develop a sense of whole numbers and represent and use them in flexible ways, including relating, composing, and decomposing numbers.
- Develop understanding of the relative magnitude of whole numbers and the concepts of sequences, quantity, and the relative positions of numbers.
- Understand conservation of quantity and number.
- Use multiple models to illustrate understandings of the base-ten number system and place value concepts.
- Understand that fractions are equal partitions.

Core Idea 2: Number Operations

Understand the meanings of operations and how they relate to each other, make reasonable estimates, and compute fluently.

- Develop an understanding of the different meanings of addition and subtraction of whole numbers and the relationship between the two operations.
- Develop fluency in adding and subtracting whole numbers within 20.
- Develop and use strategies to estimate and calculate.
- Begin to develop an understanding of the concepts of multiplication and division through situations such as equal groupings of objects and equal sharing.

Core Idea 3: Patterns, Functions, and Algebra

Understand patterns and use mathematical models to represent and to understand qualitative and quantitative relationships.

- Describe and extend patterns of sound, shape, or number and translate from one representation to another.
- Describe and extend growing as well as repeating patterns.
- Use the general principles and properties of operations, such as commutativity, with specific numbers.
- Model problem situations using objects, pictures, and symbols
- Describe change qualitatively, such as students growing **taller** or the weather turning **colder**.

Core Idea 4: Geometry and Measurement

Students will recognize and use characteristics, properties, and relationships of two- and three-dimensional geometric shapes and apply appropriate techniques to determine measurements.

- Begin to describe and classify two- and three-dimensional shapes according to the common attributes and/or parts of their shapes.
- Compare the length, weight, and volume of objects by using direct comparison or non-standard units.
- Develop an understanding of the standard units of measuring time.

Core Idea 5: Data Analysis

Students collect, organize, display, and interpret data about themselves and their surroundings.

- Collect information from group generated survey question.
- Represent data using pictures, bar graphs, tally charts, Venn diagrams and pictographs.
- Describe parts of the data and the set of data as a whole to determine what the data shows.

Core Ideas - Second Grade

Core Idea 1: Number Properties

Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

- Understand whole numbers and represent and use them in flexible ways, including relating, composing, and decomposing numbers.
- Understand the relative magnitude of whole numbers and the concepts of sequences, quantity, and the relative position of numbers.
- Demonstrate an understanding of the base-ten number system and place value concepts.
- Represent commonly used fractions such as $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$ in a variety of ways.

Core Idea 2: Number Operations

Understand the meanings of operations and how they relate to each other, make reasonable estimates, and compute fluently.

- Demonstrate fluency in adding and subtracting whole numbers.
- Use strategies to estimate and judge the reasonableness of results.
- Understand situations that entail multiplication and division such as equal groupings of objects and equal sharing.

Core Idea 3: Patterns, Functions, and Algebra

Understand patterns and use mathematical models to represent and to understand qualitative and quantitative relationships.

- Describe, extend, and create patterns of sound, shape, and number and translate from one representation to another.
- Describe, extend, and create growing as well as repeating patterns.
- Compare principles and properties of operations, such as commutativity, between addition and subtraction.
- Use concrete, pictorial, and verbal representations to develop an understanding of symbolic notations.
- Describe change quantitatively such as a student's growing **two** inches in one year.

Core Idea 4: Geometry and Measurement

Students will recognize and use characteristics, properties, and relationships of two- and three-dimensional geometric shapes and apply appropriate techniques to determine measurements.

- Describe and classify two- and three-dimensional shapes according to their attributes and/or parts of their shapes.
- Develop an understanding of how shapes can be put together or taken apart to form other shapes.
- Develop an understanding of line symmetry.
- Understand how to measure using non-standard and standard units.
- Select an appropriate unit and tool for the attribute being measured (length, volume, weight, area, time).
- Use number concepts in geometric contexts.

Core Idea 5: Data Analysis

Students collect, organize, display, and interpret data about themselves and their surroundings.

- Write a survey question for a given situation.
- Represent and interpret data using pictographs, bar graphs, tally charts, Venn diagrams and other representations.
- Describe and compare data using qualitative and quantitative measures.
- Represent the same data in more than one way.

Core Ideas -Third Grade

Third Grade- Core Idea 1: Number Properties

Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

- Develop a sense of whole numbers and represent and use them in flexible ways, including relating, composing, and decomposing numbers.
- Develop understanding of the relative magnitude of whole numbers and the concepts of sequence, quantity, and the relative positions of numbers.
- Understand the place-value structure of the base-ten number system including being able to represent and compare whole numbers and decimals (in the context of dollars and cents).

Third Grade - Core Idea 2: Number Operations

Understand the meanings of operations and how they relate to each other, make reasonable estimates, and compute fluently.

- Understand different meanings of addition and subtraction of whole numbers and the relationship between the two operations.
- Understand the effects of adding and subtracting whole numbers.
- Understand multiplication as repeated addition, an area model, an array, and an operation on scale.
- Develop fluency in adding and subtracting whole numbers.
- Develop and use strategies to estimate and judge the reasonableness of results.
- Solve problems involving dollars and cents.

Third Grade - Core Idea 3: Patterns, Functions, and Algebra

Understand patterns and use mathematical models to represent and to understand qualitative and quantitative relationships.

- Describe and extend geometric and numeric patterns.
- Represent and analyze patterns using words and/or tables.
- Illustrate general principles and properties of operations, such as commutativity, using specific numbers.
- Use concrete, pictorial, and verbal representations to develop an understanding of invented and conventional symbolic notations.
- Model problem situations with objects and use representations such as graphs and tables to draw conclusions.
- Describe qualitative change, (such as students growing taller).
- Describe quantitative change (such as a student's growing two inches in one year).
- Solve simple problems involving a functional relationship (two quantities which vary together, like finding the total cost of multiple items when you know the cost of one.)

Third Grade - Core Idea 4: Geometry and Measurement

Recognize and use characteristics, properties, and relationships of two-dimensional geometric shapes and apply appropriate techniques to determine measurements.

- Choose appropriate units and tools for particular tasks and use these units and tools to estimate and measure (length, weight, temperature, time, and capacity).
- Identify and compare attributes of two-dimensional shapes and develop vocabulary to describe the attributes.
- Calculate perimeter and area and be able to distinguish between the two measures (area may be measured by covering a figure with squares).
- Use visualization, spatial reasoning, and geometric modeling to solve problems.
- Recognize geometric ideas and relationships and apply them to problems.

Third Grade - Core Idea 5: Data Analysis

Collect, organize, display, and interpret data about themselves and their surroundings.

- Describe important features of a set of data (maximum, minimum, increasing, decreasing, most, least, and comparison).
- Represent data using tables, line plots, bar graphs, and pictographs.

Core Ideas - Fourth Grade

Fourth Grade - Core Idea 1: Number Properties

Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

- Develop an understanding of fractions as a part of unit whole, as part of a collection, and as a location on a number line.
- Use models, benchmarks, and equivalent forms to judge the size of friendly fractions.
- Recognize and generate equivalent forms of commonly used fractions.

Fourth Grade - Core Idea 2: Number Operations

Understand the meanings of operations and how they relate to each other, make reasonable estimates, and compute fluently.

- Understand division as the inverse operation of multiplication, the operation of sharing (partitive), partitioning (measurement), repeated subtraction, and an operation to determine rates.
- Develop fluency with basic number combinations for multiplication and division and use these combinations to mentally compute related problems.
- Develop fluency in multiplying whole numbers.

Fourth Grade - Core Idea 3: Patterns, Functions, and Algebra

Understand patterns and use mathematical models to represent and to understand qualitative and quantitative relationships.

- Represent and analyze patterns and functions using words, tables, and graphs.
- Find the results of a rule for a specific value.
- Use inverse operations to solve multi-step problems.
- Use concrete, pictorial, and verbal representations to solve problems involving unknowns.
- Understand and use the concept of equality.

Fourth Grade - Core Idea 4: Geometry and Measurement

Use characteristics, properties, and relationships of two-dimensional geometric shapes and apply appropriate techniques to determine measurements. Examine, compare, and analyze attributes of geometric figures.

- Classify two-dimensional shapes according to their properties and develop definitions of classes of shapes such as triangles.
- Understand line symmetry and predict the results of sliding, flipping, or turning two-dimensional figures.
- Investigate, describe, and reason about the results of combining and subdividing figures.
- Understand and use appropriate techniques to determine measurement.

Fourth Grade - Core Idea 5: Data Analysis

Collect, organize, represent and interpret numerical and categorical data, and clearly communicate their findings. Students understand and apply basic concepts of probability.

- Represent data using tables, charts, line plots, and bar graphs.
- Interpret data to answer questions about a situation.
- Describe the shape and important features of a set of data.
- Describe events as *likely* or *unlikely* and discuss the degree of likelihood (using such words as *certain*, *equally likely*, and *impossible*).
Predict the probability of simple experiments and express the results numerically (e.g. 3 out of 4).

Core Ideas - Fifth Grade

Fifth Grade - Core Idea 1: Number Properties

Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

- Use models, benchmarks, and equivalent forms to judge the size of fractions.
- Recognize and generate equivalent forms of commonly used fractions and decimals.
- Understand the place-value structure of the base-ten number system including being able to represent and compare rational numbers.
- Describe classes of numbers according to characteristics such as the nature of their factors.

Fifth Grade - Core Idea 2: Number Operations

Understand the meanings of operations and how they relate to each other, make reasonable estimates, and compute fluently.

- Develop fluency in dividing whole numbers.
- Understand the meaning of remainders by modeling division problems.
- Reason about and solve problem situations that involve more than one operation in multi-step problems.
- Use visual models, benchmarks and equivalent forms to add and subtract commonly used fractions and decimals.
- Develop and use strategies to solve problems involving number operations with fractions and decimals relevant to students' experience.

Fifth Grade - Core Idea 3: Patterns, Functions and Algebra

Understand patterns and use mathematical models such as algebraic symbols and graphs to represent and understand quantitative relationships.

- Represent the idea of a variable as an unknown quantity using a letter or a symbol.
- Express mathematical relationships using equations and graph them on a coordinate grid.
- Investigate how a change in one variable relates to a change in a second variable.
- Identify and describe situations with constant and varying rates of change and compare them.
- Understand and use properties of operations, such as the distributive property of multiplication over addition.

Fifth Grade - Core Idea 4: Geometry and Measurement

Analyze characteristics and properties of two- and three-dimensional geometric shapes, understand attributes, and apply appropriate techniques, tools, and formulas to determine measurements.

- Understand such attributes as length, area, weight, volume, and angle size and select the appropriate type of unit for measuring each attribute (volume may be measured by filling an object).
- Develop, understand, and use methods to find the area of rectangles and use that understanding of rectangles to find areas of triangles and parallelograms.
- Develop strategies for estimating or calculating the perimeters and areas of irregular shapes.
- Identify, compare, and analyze attributes of two- and three-dimensional shapes, and develop vocabulary to describe the attributes.
- Explore and determine what happens to perimeter and area of a two-dimensional figure when its shape is changed in some way.

Fifth Grade - Core Idea 5: Data Analysis

Display, analyze, compare and interpret different data sets.

- Compare different sets of data.
- Use measures of center (mean, median, and mode) and understand what each does and does not indicate about the data set.
- Compare different representations of the same data and evaluate how well each representation shows important aspects of the data.
- Organize and display data in appropriate graphs and representations (e.g., histograms and line graphs) and explain which types of graphs are appropriate for different kinds of data sets.)

Core Ideas - Sixth Grade

Sixth Grade - Core Idea 1: Number and Operation

Understand number systems, the meanings of operations, and ways of representing numbers, relationships, and number systems.

- Understand fractions, decimals, and percents as parts of unit wholes and as parts of a collection.
- Recognize and generate equivalent forms of commonly used fractions, decimals, and percents.
- Compare and order fractions, decimals, and percents efficiently and find their approximate locations on a number line.
- Understand the meaning and effects of operations with fractions and decimals.
- Use factors, multiples, prime factorization, and relatively prime numbers to solve problems.
- Select appropriate methods and tools for computing with fractions and decimals from among mental computation, estimation, calculators, and paper-and-pencil, depending on the situation, and apply selected methods.
- Develop and analyze algorithms for operations on fractions and decimals, and develop fluency in their use.
- Understand and use proportional reasoning to represent quantitative relationships.
- Understand and use the associative and commutative properties of addition to simplify computations with fractions, decimals, and whole numbers.

Sixth Grade -Core Idea 2: Probability

Demonstrate understanding and use of probability in problem situations.

- Determine theoretical and experimental probabilities and use these to make predictions about events.
- Understand that the measure of the likelihood of an event can be represented by a number from 0 to 1.
- Represent probabilities as ratios, proportions, decimals or percents.
- Represent the sample space for a given event in an organized way (e.g. table, diagram, organized list, and tree diagram).

Sixth Grade -Core Idea 3: Algebra and Functions

Understand relations and functions, analyze mathematical situations, and use models to solve problems involving quantity and change.

- Represent, analyze, and generalize a variety of relations and functions with tables, graphs, and words.
- Use symbolic algebra to represent situations and to solve linear equations.
- Model and solve contextualized problems using various representations, such as graphs, tables, and equations.

Sixth Grade - Core Idea 4: Geometry and Measurement

Analyze characteristics and properties of two- and three-dimensional geometric shapes, use symmetry to predict and describe the results of sliding, flipping and turning two-dimensional shapes; and apply the appropriate techniques, tools, and formulas to determine measurements.

- Describe, classify, and understand relationships among types of two- and three-dimensional objects, using their defining properties.
- Develop, understand and use formulas to determine the area of triangles, quadrilaterals, and the circumference and area of circles.
- Investigate, describe, and reason about the results of subdividing, combining, and transforming shapes.
- Understand line and rotational symmetry and predict the results of these transformations.
- Select and apply techniques and tools to accurately find length, area, and angle measures to appropriate levels of precision.

Sixth Grade - Core Idea 5: Statistics

Select and use appropriate statistical methods to display, analyze, compare and interpret different data sets.

- Compare data sets using measures of center and spread (mean, median, mode, range, outlier, and difference from the mean) to understand what each indicates about the data sets.
- Represent and analyze data in the form of graphs including circle graphs.

Core Ideas -Seventh Grade

Seventh Grade - Core Idea 1: Number and Operation

Understand number systems, the meanings of operations, and ways of representing numbers, relationships, and number systems.

- Develop, analyze and explain methods for solving problems involving proportional reasoning, such as scaling and finding equivalent ratios.
- Develop meaning of integers and represent and compare quantities with them.
- Understand the meaning and effects of operations with rational numbers.
- Understand and use the inverse relationships of a series of operations to simplify computations and solve problems.
- Develop and analyze algorithms for computing with rational numbers.
- Use the associative and commutative properties of addition and multiplication and the distributive property of multiplication over addition to simplify computations with rational numbers.
- Develop and use strategies to estimate the results of rational number computations, and judge the reasonableness of results.
- Work flexibly with fractions, decimals, and percents to solve problems.

Seventh Grade - Core Idea 2: Probability

Apply and deepen their understanding of theoretical and empirical probability.

- Represent the sample space for simple and compound events in an organized way (table, diagram, organized list, and tree diagram) and express the theoretical probability of each outcome.
- Use data to estimate the probability of future events (e.g., batting averages or number of accidents per mile driven).
- Know the relationship between the probability of an event and its complement (i.e., if the probability of an event is P , then the probability of the event not occurring is $1 - P$).
- Identify data that represent sampling errors and explain why the sample and the display might be biased.

Seventh Grade - Core Idea 3: Algebra and Functions

Understand relations and functions, analyze mathematical situations, and use models to solve problems involving quantity and change.

- Represent, analyze, and generalize a variety of functions including linear and simple exponential relationships
- Relate and compare different forms of representation for a relationship including words, tables, graphs in the coordinate plane, and symbols.
- Express mathematical relationships using expressions and equations.
- Develop conceptual understanding of different uses of variables.
- Use symbolic algebra to represent situations to solve problems.
- Identify and describe situations with constant or varying rates of change and compare them.

Seventh Grade - Core Idea 4: Geometry and Measurement

Analyze characteristics and properties of two- and three-dimensional geometric shapes; develop mathematical arguments about geometric relationships; apply congruence and similarity to analyze mathematical situations; and apply appropriate techniques, tools, and formulas to determine measurements.

- Understand relationships among the angles, side lengths, perimeters, and areas of similar objects.
- Develop and critique inductive and deductive arguments concerning geometric ideas and relationships, such as congruence and similarity.
- Solve problems involving similarity and scale factors, using proportional reasoning.

Seventh Grade - Core Idea 5: Statistics

Students deepen their understanding of statistical methods used to display, analyze, compare and interpret different data sets.

- Make predictions, justify conclusions that are based on data, and design studies to further investigate the predictions and conclusions.
- Construct the most appropriate graph, including frequency distribution, stem and leaf, and scatterplot, for a given set of data and justify the choice.
- Analyze data, including finding measures of center and spread presented in a frequency distribution.

Core Ideas - Eighth Grade

Eighth Grade - Core Idea 1: Number and Operations

Understand number systems, the meanings of operations, and ways of representing numbers, relationships, and number systems.

- Develop meaning for percents greater than 100 and less than 1.
- Develop an understanding of large numbers and recognize and appropriately use exponential, scientific and calculator notation.
- Understand and use the inverse relationships of squaring and finding square roots to simplify computations and solve problems.
- Demonstrate how and when to use the operations of exponents and roots.
- Compare and contrast the properties rational and irrational numbers.

Eighth Grade - Core Idea 2: Mathematical Reasoning

Employ forms of mathematical reasoning and justification appropriately to the solution of a problem.

- Extract pertinent information from situations and determine what additional information is needed.
- Formulate conjectures and test them for validity.
- Invoke problem-solving strategies.
- Verify and interpret results of a problem.
- Use mathematical language to representations to make complex situations easier to understand.

Eighth Grade - Core Idea 3: Algebra and Functions

Understand relations and functions, analyze mathematical situations, and use models to solve problems involving quantity and change.

- Identify functions as linear or nonlinear, and contrast their properties from tables, graphs, or equations.
- Explore relationships between symbolic expressions and graphs of lines, paying particular attention to the meaning of intercept and slope.
- Recognize and generate equivalent forms of simple algebraic expressions and solve linear equations
- Model and solve contextualized problems involving inequalities
- Use graphs to analyze the nature of changes on quantities in linear relationships
- Recognize, represent and solve contextualized problems involving polynomials and their factors

Eighth Grade - Core Idea 4: Geometry and Measurement

Analyze characteristics and properties of two- and three-dimensional geometric shapes; develop mathematical arguments about geometric relationships; apply transformations and use symmetry to analyze mathematical situations; and apply appropriate techniques, tools, and formulas to determine measurements.

- Develop strategies to determine the surface area and volume of selected prisms, pyramids, and cylinders.
- Understand relationships among the angles, side lengths, perimeter, areas, and volumes of similar objects.
- Create and critique inductive and deductive arguments concerning geometric ideas and relationships, such as congruence, similarity, and the Pythagorean relationship.
- Describe sizes, positions, and orientations of shapes under informal transformations such as flips, turns, slides, and scaling.

Eighth Grade - Core Idea 5: Data Analysis

Formulate questions that can be addressed with data and collect, organize, analyze, and display relevant data to answer them.

- Formulate questions, design studies, and collect data about a characteristic shared by two populations or different characteristics within one population.
- Select, create, and use appropriate graphical representations of data, including box plots and scatterplots.
- Find, use, and interpret measures of center and spread, including inter-quartile range.
- Discuss and understand the correspondence between data sets and their graphical representations, especially box plots and scatterplots.
- Make conjectures about possible relationships between two characteristics of a population on the basis of scatterplots of the data, including correlations and approximate lines of fit.

Core Ideas - Course One (Algebra)

Course One - Core Idea 1: Functions and Relations

Understand patterns, relations, and functions.

- Generalize patterns using explicitly defined functions.
- Understand relations and functions and select, convert flexibly among, and use various representations for them.
- Analyze functions of one variable by investigating local and global behavior, including slopes as rates of change, intercepts and zeros.

Course One - Core Idea 2: Mathematical Reasoning

Employ forms of mathematical reasoning and proof appropriate to the solution of the problem, including deductive and inductive reasoning, making and testing conjectures and using counterexamples and indirect proof.

- Show mathematical reasoning in a variety of ways, including words, numbers, symbols, pictures, charts, graphs, tables, diagrams, and models.
- Explain the logic inherent in a solution process.
- Use induction to make conjectures and use deductive reasoning to prove conclusions.
- Draw reasonable conclusions about a situation being modeled

Course One - Core Idea 3: Algebraic Properties and Representations

Represent and analyze mathematical situations and structures using algebraic symbols.

- Compare and contrast the properties of numbers and number systems including real numbers.
- Understand the meaning of equivalent forms of expressions, equations, inequalities, or relations.
- Write equivalent forms of equations, inequalities and systems of equations and solve them.
- Use symbolic algebra to represent and explain mathematical relationships.
- Judge the meaning, utility, and reasonableness of results of symbolic manipulations.
- Use symbolic expressions to represent relationships arising from various contexts.
- Approximate and interpret rates of change, from graphic and numeric data.

Course One - Core Idea 4: Geometry and Measurement

Describe spatial relationships using coordinate geometry; develop mathematical arguments about geometric relationships; understand measurable attributes of objects; and understand the units, systems, and process of measurement.

- Investigate conjectures and solve problems involving two-dimensional objects represented with Cartesian coordinates.
- Solve problems that involve measurement units and scale factors.
- Use geometric models to gain insights into, and answer questions in, other areas of mathematics.

Course One -Core Idea 5: Data Analysis

Select and use appropriate statistical methods to analyze data and understand and apply basic concepts of probability.

- Understand the relationship between two sets of data (bivariate), display such data in a scatterplot, and describe trends and shape of the plot including correlations (positive, negative, or no) and lines of best fit.
- Make inferences based on the data and evaluate the validity of conclusions drawn.
- Compute and interpret the expected value of random variables in simple cases.
- Understand the concepts of conditional probability and independent events and compute the probability of a compound event.

Core Ideas - Course Two (Geometry)

Course Two - Core Idea 1: Functions

Understand patterns, relations, and functions.

- Understand and perform transformations on functions.
- Understand and compare the properties of classes of functions, including linear, quadratic, reciprocal and exponential functions.
- Identify essential quantitative relationships in a situation and determine the class or classes of functions that might model the relationships.

Course Two - Core Idea 2: Mathematical Reasoning and Proofs

Employ forms of mathematical reasoning and proof appropriate to the solution of the problem at hand, including deductive and inductive reasoning, making and testing conjectures and using counter examples and indirect proof.

- Show mathematical reasoning in solutions in a variety of ways, including words, numbers, symbols, pictures, charts, graphs tables, diagrams and models.
- Explain the logic inherent in a solution process.
- Identify, formulate and confirm conjectures.
- Use synthetic, coordinate, and /or transformational geometry in direct or indirect proof of geometric relationships.
- Establish the validity of geometric conjectures using deduction; prove theorems, and critique arguments made by others.

Course Two - Core Idea 3: Algebraic Properties and Representations

Represent and analyze mathematical situations and structures using algebraic symbols.

- Develop fluency in operations with real numbers and simple vectors and matrices.
- Solve equations involving radicals and exponents in contextualized problems such as use of Pythagorean Theorem.
- Recognize and use equivalent graphical and algebraic representations of lines with their geometric characteristics, such as slope, intercepts, parallelism, and perpendicularity.
- Use coordinate geometry to find measures of geometric figures

Course Two - Core Idea 4: Geometry and Measurement

Analyze characteristics and properties of two- and three-dimensional geometric shapes; develop mathematical arguments about geometric relationships; and apply appropriate techniques, tools, and formulas to determine measurements.

- Understand and use formulas for the area, surface area, and volume of geometric figures, including spheres and cylinders.

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- Explore relationships among classes of two- and three-dimensional geometric objects, make and test conjectures about them, and solve problems involving them.
- Understand and represent translations, reflections, rotations, and dilations of objects in the plane by using sketches, coordinates, and function notation.
- Draw and construct representations of two- and three-dimensional geometric objects using a variety of tools.
- Visualize three-dimensional objects from different perspectives and analyze their cross sections.

Course Two - Core Idea 5: Data Analysis

Select and use appropriate statistical methods to analyze data and understand and apply concepts of probability.

- Find, use, and interpret measures of center and spread, including standard deviation.
- For bivariate measurement data, be able to display a scatterplot, describe its shape, and determine regression coefficients, regression equations, and correlation coefficients using technological tools.
- Evaluate studies that are based on data by examining the design of the study, the appropriateness of the data analysis, and the validity of conclusions.
- Apply the concept of expected value in problem situations.
- Use and interpret problems involving probability in terms of areas of geometric figures.