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Topics & Standards *Quarter 1* *Time Frame Weeks 1-8*	**UNIT 1** **STATISTICS AND PROBABILITY - CONDITIONAL PROBABILITY AND THE RULES OF PROBABILITY** **Understand independence and conditional probability and use them to interpret data** • **S-CP.1** Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). • **S-CP.2** Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent. • **S-CP.3** Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B. **Key Concepts and Skills** • Review basic probability concepts. • Discuss and compare theoretical and empirical probability. • Use sample experiments to determine the reasonableness of theoretical models. • Find the complement of an event. • Compute conditional probabilities. • Compute joint probabilities.

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UNIT 2

STATISTICS AND PROBABILITY - USING PROBABILITY TO MAKE DECISIONS

Calculate expected values and use them to solve problems

- **S-MD.1** Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.
- **S-MD.2** Calculate the expected value of a random variable.
- **S-MD.5** Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.
  - **a.** Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast- food restaurant.
  - **b.** b. Evaluate and compare strategies on the basis of expected values. For example, compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.
- **S-MD.6** Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).
- **S-MD.7** Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

Key Concepts and Skills

- Read, review data, find a model, make predictions and use multiple approaches to solve problems from a variety of disciplines and select a method to solve a problem, defend the method, and justify the reasonableness of the results.
- Discuss and solve problems dealing with mutually exclusive events with and without replacement.
- Discuss and solve problems involving the odds of an event versus probability.
- Define and model tree diagrams and the fundamental counting principle.
- Compute posterior probabilities.
- Use technology to compute permutations and combinations.

For guidance with I can statements, clarifications, Enduring Understandings, and Essential Questions, see your provided resource titled, The Common Core, Clarifying Expectations for Teachers & Students, 2011 Edition.

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UNIT 3

INTERPRETING FUNCTIONS - UNDERSTAND THE CONCEPT OF A FUNCTION AND USE FUNCTION NOTATION

Interpret functions that arise in applications in terms of the context

- **F-IF.4** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.
- **F-IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.
- **F-IF.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

Analyze functions using different representations

- **F-IF.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
    - **a.** Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
    - **b.** Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
    - **c.** Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude

Key Concepts and Skills

- Read and review data, find a model, make predictions and use multiple approaches to solve problems from a variety of disciplines and select a method to solve a problem, defend the method, and justify the reasonableness of the results.
- Graph data in order to analyze and find a model that will fit the data and make predictions and draw reasonable conclusions from the data.
- Analyze numerical data using measures of central tendency, variability, and correlation in order to make inferences.

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	Curriculum Units & Assessment (Evidence)	*Opportunities for Integration*	*Resources (Curriculum & Textbook)*	*Key Concept tools & practices for Differentiation*
	UBD Framework **Units: _____** **Formative & Summative Assessments** • 4-7 tasks that reach DOK 3-4 AND/OR • 3-5 FATPs / RAFTs • At least (1) GRASPS per quarter & • At least 1 common short cycle per quarter *Assessments are located within unit **Textbook Resources (Formative, Pre/Post, and Summative):** • Bellwork • Chapter Tests • Quizzes, • Textbook Investigations		**Modeling With Mathematics: A Bridge to Algebra 2 Textbook** • Chapter 9: • Chapter 2: **Instructional Resources within the Text:** **Other Resources** • Illustrative Mathematics - https://www.illustrativemathematics.org/content-standards/HSA • ODE Math Model Curriculum	**Tools and practices:** • Journals • Concept/Anchor Charts • Non-linguistic representations • Discourse and questioning

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Topics & Standards ***Quarter 2*** ***Time Frame Weeks 1-8***	**Unit 4** **FUNCTIONS - BUILDING FUNCTIONS** **Build a function that models a relationship between two quantities.** • **F-FB.1** Write a function that describes a relationship between two quantities. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. c. Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time **FUNCTIONS - INTERPRETING FUNCTIONS** **Build new functions from existing functions.** • **F-IF.4** Find inverse functions. **a.** Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2 x3 or f(x) = (x+1)/(x–1) for x ≠ 1. **b.** Verify by composition that one function is the inverse of another. **c.** Read values of an inverse function from a graph or a table, given that the function has an inverse. **d.** Produce an invertible function from a non-invertible function by restricting the domain. • **F-IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function. • **F-IF.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. **Key Concepts and Skills:** • Formulate a meaningful question, determine the data needed to answer the question, gather the appropriate data, analyze the data, and draw reasonable conclusions. • Determine the appropriateness of a model for making predictions from a given set of data. • Use direct and inverse variation to describe physical laws such as Hook's, Newton's, and Boyle's laws. • Use multiple approaches (algebraic, graphical, and geometric methods) to solve problems from a variety of disciplines. • Interpret information from various graphs, including line graphs, bar graphs, circle graphs, histograms, scatterplots, line plots, stem-and-leaf plots, and box-and-whisker plots to draw conclusions from the data. • Compare and analyze various methods for solving a real-life problem. **For guidance with I can statements, clarifications, Enduring Understandings, and Essential Questions, see your provided resource titled, The Common Core, Clarifying Expectations for Teachers & Students, 2011 Edition.**

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UNIT 5

FUNCTIONS – LINEAR, QUADRATIC, AND EXPONENTIAL MODELS

Construct and Compare Linear and Exponential Models and Solve Problems

- **F-LE.1** Distinguish between situations that can be modeled with linear functions and with exponential functions.
  - **a.** Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
  - **b.** Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
  - **c.** Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
- **F-LE.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
- **F-LE.3** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
- **F-LE.4** For exponential models, express as a logarithm the solution to ab™= d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.

Interpret expressions for functions in terms of the situation they model

- **F-LE.5** Interpret the parameters in a linear or exponential function in terms of a context.

Key Concepts and Skills:

- Determine the appropriateness of a model for making predictions from a given set of data.
- Use geometric models available through technology to model growth and decay in areas such as population, biology, and ecology.
- Use multiple approaches (algebraic, graphical, and geometric methods) to solve problems from a variety of disciplines.
- Select a method to solve a problem, defend the method, and justify the reasonableness of the results.
- Use geometric transformations, symmetry, and perspective drawings to describe mathematical patterns and structure in art and architecture.

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	Curriculum Unis & Assessment (Evidence)	*Opportunities for Integration*	*Resources (Curriculum & supplemental)*	*Key Concept tools & Practices for Differentiation*
	UBD Framework **Units: _____** **Formative & Summative Assessments** • 4-7 tasks that reach DOK 3-4 AND/OR • 3-5 FATPs / RAFTs • At least (1) GRASPS per quarter & • At least 1 common short cycle per quarter *Assessments are located within unit **Textbook Resources (Formative, Pre/Post, and Summative):** • Bellwork • Chapter Tests • Quizzes, • Textbook Investigations		**Modeling With Mathematics: A Bridge to Algebra 2 Textbook** • Chapter 1: • Chapter 6: **Instructional Resources within the Text:** • **Other Resources** • Illustrative Mathematics - https://www.illustrativemathematics.org/content-standards/HSA • ODE Math Model Curriculum	**Tools and practices:** • Journals • Concept/Anchor Charts • Non-linguistic representations • Discourse and questioning

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Topic & Standard *Quarter 3* *Time Frame Weeks 1-8*	**UNIT 6** **<u>INTERPRETING FUNCTIONS - UNDERSTAND THE CONCEPT OF A FUNCTION AND USE FUNCTION NOTATION</u>** **Interpret functions that arise in applications in terms of the context** • **F-IF.4** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. • **F-IF.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. **Analyze functions using different representations** • **F-IF.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. **a.** Graph linear and quadratic functions and show intercepts, maxima, and minima. **b.** Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. **c.** Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. **d.** Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. **e.** Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude **<u>FUNCTIONS – LINEAR, QUADRATIC, AND EXPONENTIAL MODELS</u>** **Construct and Compare Linear and Exponential Models and Solve Problems** • **F-LE.1** Distinguish between situations that can be modeled with linear functions and with exponential functions. **d.** Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. **e.** Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. **f.** Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. **Key Concepts and Skills:** • Use multiple approaches (algebraic, graphical, and geometric methods) to solve problems from a variety of disciplines • Determine the appropriateness of a model for making predictions from a given set of data • Use geometric models available through technology to model growth and decay in areas such as population, biology, and ecology • Use direct and inverse variation to describe physical laws such as Hook's, Newton's, and Boyle's laws **For guidance with I can statements, clarifications, Enduring Understandings, and Essential Questions, see your provided resource titled, <u>The Common Core, Clarifying Expectations for Teachers & Students</u>, 2011 Edition.**

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UNIT 7

FUNCTIONS – UNDERSTAND THE CONCEPT OF A FUNCTION AND USE FUNCTION NOTATION

Analyze functions using different representations

- **F-IF.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
  - **e.** Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude

FUNCTIONS – LINEAR, QUADRATIC, AND EXPONENTIAL MODELS

Construct and Compare Linear and Exponential Models and Solve Problems

- **F-LE.4** For exponential models, express as a logarithm the solution to ab™= d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.

ALGEBRA - SEEING STRUCTURE IN EXPRESSIONS

Interpret the structure of expressions

- **A-SSE.1** Interpret expressions that represent a quantity in terms of its context.
  - **a.** Interpret parts of an expression, such as terms, factors, and coefficients.
  - **b.** Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)n as the product of P and a factor not depending on P

Key Concepts and Skills

- Use multiple approaches (algebraic, graphical, and geometric methods) to solve problems from a variety of disciplines.
- Determine the appropriateness of a model for making predictions from a given set of data.
- Use geometric models available through technology to model growth and decay in areas such as population, biology, and ecology.
- Use rates, linear functions, and direct variation to solve problems involving personal finance and budgeting, including compensations and deductions.
- Solve problems involving personal taxes.
- Analyze and compare coverage options and rates in insurance.

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UNIT 8

ALGEBRA - SEEING STRUCTURE IN EXPRESSIONS

Interpret the structure of expressions

- **A-SSE.1** Interpret expressions that represent a quantity in terms of its context.
  - **a.** Interpret parts of an expression, such as terms, factors, and coefficients.
  - **b.** Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)n as the product of P and a factor not depending on P

NUMBER AND QUANTITY - QUANTITIES

Reason quantitatively and use units to solve problems.

- **N-Q.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- **N-Q.2** Define appropriate quantities for the purpose of descriptive modeling.
- **N-Q.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

GEOMETRY - SIMILARITY, RIGHT TRIANGLES, AND TRIGONOMETRY

Understand similarity in terms of similarity transformations

- **G-SRT.2** Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

Prove theorems involving similarity

- **G-SRT.4** Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
- **G-SRT.5** Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Define trigonometric ratios and solve problems involving right triangles

- **G-SRT.6** Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.
- **G-SRT.7** Explain and use the relationship between the sine and cosine of complementary angles.
- **G-SRT.8** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Key Concepts and Skills

- Use amortization models to investigate automobile financing and compare buying and leasing a vehicle.
- Analyze and compare coverage options and rates in insurance. Use multiple approaches (algebraic, graphical, and geometric methods) to solve problems from a variety of disciplines
- Use trigonometric ratios and functions available through technology to calculate distances and model periodic motion

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Topic & Standard Quarter 4 *Time Frame Weeks 1-8*	**UNIT 9** **FUNCTIONS – TRIGONOMETRIC FUNCTIONS** **Extend the domain of trigonometric functions using the unit circle** • **F-TF.1** Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. **Model periodic phenomena with trigonometric functions** • **F-TF.5** Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline • **F-TF.7** Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context. **Key Concepts and Skills** • Determine the appropriateness of a model for making predictions from a given set of data • Use trigonometric ratios and functions available through technology to calculate distances and model periodic motion • Use regression methods available through technology to describe various models for data such as linear, quadratic, exponential, etc., select the most appropriate model, and use the model to interpret information • Use geometric transformations, proportions, and periodic motion to describe mathematical patterns and structure in music. **For guidance with I can statements, clarifications, Enduring Understandings, and Essential Questions, see your provided resource titled, The Common Core, Clarifying Expectations for Teachers & Students, 2011 Edition.**			
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