

## PROGRAM OVERVIEW

# Table of Contents for Instructional Units

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### **Unit 1: Inferences and Conclusions from Data**

#### **Topic A: Using the Normal Curve**

Lesson 1.1.1: Normal Distributions and the 68–95–99.7 Rule

Lesson 1.1.2: Standard Normal Calculations

Lesson 1.1.3: Assessing Normality

#### **Conceptual Activities**

GeoGebra. “192 Normal Distribution Simulation: Bike & Wall.”

GeoGebra. “Algebra 2 Lesson 7.”

GeoGebra. “Normal Curve Demonstration.”

Illustrative Math. “Normal Distributions.”

#### **Conceptual Tasks**

Tons of Tuna, Parts 1 and 2

Illustrative Mathematics. “Should We Send Out a Certificate?”

#### **Topic B: Populations Versus Random Samples and Random Sampling**

Lesson 1.2.1: Differences Between Populations and Samples

Lesson 1.2.2: Simple Random Sampling

Lesson 1.2.3: Other Methods of Random Sampling

#### **Conceptual Activity**

GeoGebra. “Sampling from a population of ordered pairs.”

#### **Topic C: Surveys, Experiments, and Observational Studies**

Lesson 1.3.1: Identifying Surveys, Experiments, and Observational Studies

Lesson 1.3.2: Designing Surveys, Experiments, and Observational Studies

#### **Conceptual Task**

Studying Shoppers, Parts 1 and 2

#### **Topic D: Estimating Sample Proportions and Sample Means**

Lesson 1.4.1: Estimating Sample Proportions

Lesson 1.4.2: The Binomial Distribution

Lesson 1.4.3: Estimating Sample Means

Lesson 1.4.4: Estimating with Confidence

#### **Conceptual Activities**

GeoGebra. “Binomial Distribution with Normal Approximation.”

GeoGebra. “Student-t vs. Z.”

#### **Conceptual Task**

Tracking Ticks, Parts 1 and 2

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#### **Topic E: Comparing Treatments and Reading Reports**

Lesson 1.5.1: Evaluating Treatments

Lesson 1.5.2: Designing and Simulating Treatments

Lesson 1.5.3: Reading Reports

#### **Conceptual Activities**

GeoGebra. “Simulating a Bengal’s Season.”

GeoGebra. “Simulation (2012 #4).”

GeoGebra. “Simulation (2012 #5).”

GeoGebra. “Simulation (2015 #2).”

GeoGebra. “Simulation (2015 #4).”

#### **Topic F: Making and Analyzing Decisions**

Lesson 1.6.1: Making Decisions

Lesson 1.6.2: Analyzing Decisions

#### **Conceptual Activities**

GeoGebra. “In Between Simulation.”

GeoGebra. “Number Line Simulation.”

#### **Unit Review: Inferences and Conclusions from Data**

#### **Unit 1 Assessment**

#### **Station Activities**

*z*-scores

Distributions and Estimating with Confidence

### **Unit 2A: Polynomial Relationships**

#### **Topic A: Polynomial Structures and Operating with Polynomials**

Lesson 2A.1.1: Structures of Expressions

Lesson 2A.1.2: Adding and Subtracting Polynomials

Lesson 2A.1.3: Multiplying Polynomials

#### **Conceptual Activities**

GeoGebra. “Multiplying Binomials.”

Desmos. “Polygraph: Polynomial Functions.”

#### **Conceptual Tasks**

Debating Polynomials, Parts 1 and 2

Desmos. “Constructing Polynomials.”

Desmos. “Polynomial Equation Challenges.”

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#### **Topic B: Proving Identities**

Lesson 2A.2.1: Polynomial Identities

Lesson 2A.2.2: Complex Polynomial Identities

Lesson 2A.2.3: The Binomial Theorem

#### **Topic C: Graphing Polynomial Functions**

Lesson 2A.3.1: Describing End Behavior and Turns

Lesson 2A.3.2: The Remainder Theorem

Lesson 2A.3.3: Finding Zeros

Lesson 2A.3.4: The Rational Root Theorem

#### **Conceptual Activities**

GeoGebra. “Function Behavior.”

GeoGebra. “Make Your Own.”

GeoGebra. “Polynomial End Behavior.”

GeoGebra. “Relative Extrema Illustrator.”

#### **Conceptual Tasks**

Engineering Polynomials, Parts 1 and 2

Practicing Polynomials, Parts 1 and 2

#### **Topic D: Solving Systems of Equations with Polynomials**

Lesson 2A.4.1: Solving Systems of Equations Graphically

#### **Topic E: Geometric Series**

Lesson 2A.5.1: Geometric Sequences

Lesson 2A.5.2: Sum of a Finite Geometric Series

Lesson 2A.5.3: Sum of an Infinite Geometric Series

#### **Conceptual Activities**

GeoGebra. “Proof without words :  $1/2 + 1/4 + 1/8 + \dots = 1.$ ”

GeoGebra. “Towers of Hanoi.”

#### **Unit Review: Polynomial Relationships**

##### **Unit 2A Assessment**

##### **Station Activities**

Polynomial Functions

Sequences and Series

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#### **Unit 2B: Rational and Radical Relationships**

##### **Topic A: Operating with Rational Expressions**

Lesson 2B.1.1: Structures of Rational Expressions

Lesson 2B.1.2: Adding and Subtracting Rational Expressions

Lesson 2B.1.3: Multiplying Rational Expressions

Lesson 2B.1.4: Dividing Rational Expressions

##### **Conceptual Activity**

GeoGebra. “Simplifying rational expressions and stating restrictions.”

##### **Conceptual Task**

Rationalizing Rational Functions, Parts 1 and 2

##### **Topic B: Solving Rational and Radical Equations**

Lesson 2B.2.1: Solving Rational Equations

Lesson 2B.2.2: Solving Radical Equations

Lesson 2B.2.3: Solving Systems of Equations

##### **Conceptual Activities**

Desmos. “Marbleslides: Rationals .”

Desmos. “Polygraph: Rational Functions.”

GeoGebra. “Graphs of Radical Functions.”

GeoGebra. “Investigating Rational Functions.”

GeoGebra. “Rational Function End Behavior.”

##### **Conceptual Task**

Free Fall, Parts 1 and 2

#### **Unit Review: Rational and Radical Relationships**

#### **Unit 2B Assessment**

#### **Station Activities**

Rational Expressions and Equations

Solving Systems of Equations

#### **Unit 3: Trigonometry of General Triangles and Trigonometric Functions**

##### **Topic A: Radians and the Unit Circle**

Lesson 3.1.1: Radians

Lesson 3.1.2: The Unit Circle

Lesson 3.1.3: Special Angles in the Unit Circle

Lesson 3.1.4: Evaluating Trigonometric Functions

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#### **Conceptual Activities**

GeoGebra. “Quiz: Sketching Angles in Standard Position.”

GeoGebra. “Radian Illustrator.”

GeoGebra. “Unit Circle and Cosine Graph.”

GeoGebra. “Unit Circle and Sine Graph.”

GeoGebra. “Unit Circle and Tangent Graph.”

#### **Conceptual Task**

Cutting Cakes, Parts 1 and 2

#### **Topic B: Trigonometry of General Angles**

Lesson 3.2.1: Proving the Law of Sines

Lesson 3.2.2: Proving the Law of Cosines

Lesson 3.2.3: Applying the Laws of Sines and Cosines

#### **Conceptual Activities**

GeoGebra. “Law of Cosines: Discovery.”

GeoGebra. “Law of Sines (& Area).”

GeoGebra. “Trigonometry: Law of Sines Ambiguous Case Exploration.”

#### **Conceptual Task**

Tricky Triangles, Parts 1 and 2

#### **Topic C: Graphs of Trigonometric Functions**

Lesson 3.3.1: Periodic Phenomena and Amplitude, Frequency, and Midline

Lesson 3.3.2: Using Trigonometric Functions to Model Periodic Phenomena

#### **Conceptual Activities**

Desmos. “Polygraph: Sinusoids.”

Desmos. “Polygraph: Sinusoids with Vertical Transformations.”

GeoGebra. “Graphing Sine & Cosine Functions (I).”

GeoGebra. “Graphing Sine & Cosine Functions (II).”

#### **Conceptual Tasks**

Desmos. “Burning Daylight.”

Desmos. “Graphing the Sine Function using Amplitude, Period, and Vertical Translation.”

Desmos. “Conceptual Activity: Marbleslides: Periodics.”

Desmos. “Trigonometric Graphing: Introduction to Amplitude and Vertical Shift.”

#### **Unit Review: Trigonometry of General Triangles and Trigonometric Functions**

#### **Unit 3 Assessment**

#### **Station Activities**

Trigonometric Functions

The Laws of Sines and Cosines

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#### **Unit 4A: Mathematical Modeling of Inverse, Logarithmic, and Trigonometric Functions**

##### **Topic A: Inverses of Functions**

Lesson 4A.1.1: Determining Inverses of Quadratic Functions

Lesson 4A.1.2: Determining Inverses of Other Functions

##### **Conceptual Activity**

GeoGebra. “Inverse Relations: Graphs.”

##### **Topic B: Modeling Logarithmic Functions**

Lesson 4A.2.1: Logarithmic Functions as Inverses

Lesson 4A.2.2: Common Logarithms

Lesson 4A.2.3: Natural Logarithms

Lesson 4A.2.4: Graphing Logarithmic Functions

Lesson 4A.2.5: Interpreting Logarithmic Models

##### **Conceptual Activities**

GeoGebra. “Logarithmic Action (2)!”

GeoGebra. “Logarithmic Action (3:  $V_2$ ).”

GeoGebra. “Logarithmic Action (4)  $V_2$ .”

##### **Conceptual Task**

Logs from Trees, Parts 1 and 2

##### **Topic C: Modeling Trigonometric Functions**

Lesson 4A.3.1: Graphing the Sine Function

Lesson 4A.3.2: Graphing the Cosine Function

##### **Conceptual Activity**

GeoGebra. “Transforming Sine and Cosine Functions (2): Dynamic Illustrator.”

##### **Conceptual Task**

Searching for a Sine, Parts 1 and 2

#### **Unit Review: Mathematical Modeling of Inverse, Logarithmic, and Trigonometric Functions**

##### **Unit 4A Assessment**

##### **Station Activity**

Inverse Functions

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#### **Unit 4B: Mathematical Modeling and Choosing a Model**

##### **Topic A: Creating Equations**

Lesson 4B.1.1: Creating Equations in One Variable

Lesson 4B.1.2: Representing and Interpreting Constraints

Lesson 4B.1.3: Rearranging Formulas

##### **Conceptual Activity**

Desmos. “Card Sort: Exponentials.”

##### **Topic B: Transforming a Model and Combining Functions**

Lesson 4B.2.1: Transformations of Parent Graphs

Lesson 4B.2.2: Recognizing Odd and Even Functions

Lesson 4B.2.3: Combining Functions

##### **Conceptual Activities**

Desmos. “Polygraph: Twelve Functions.”

GeoGebra. “Adding Functions Graphically.”

GeoGebra. “Animation 143.”

GeoGebra. “Animation 144.”

GeoGebra. “Even Functions!”

GeoGebra. “Function Composition: Dynamic Illustrator (2).”

GeoGebra. “Odd Functions!”

GeoGebra. “Quiz: Composition of Functions (Graph & Table).”

##### **Conceptual Task**

Temperature Transformations, Parts 1 and 2

##### **Topic C: Comparing Properties Within and Between Functions**

Lesson 4B.3.1: Reading and Identifying Key Features of Real-World Situation Graphs

Lesson 4B.3.2: Calculating Average Rates of Change

Lesson 4B.3.3: Comparing Functions

##### **Conceptual Activities**

Desmos. “Polygraph: Parent Functions.”

GeoGebra. “Average Rate of Change of a Function: Dynamic Illustration.”

##### **Conceptual Task**

Fitted Functions for Fuel Consumption, Parts 1 and 2

##### **Topic D: Choosing a Model**

Lesson 4B.4.1: Linear, Exponential, and Quadratic Functions

Lesson 4B.4.2: Piecewise, Step, and Absolute Value Functions

Lesson 4B.4.3: Square Root and Cube Root Functions

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#### **Conceptual Activities**

Desmos. “Polygraph: Exponential Functions.”

GeoGebra. “Absolute Value Function.”

GeoGebra. “Cube Root Function.”

GeoGebra. “Half-Life Function.”

#### **Conceptual Task**

Desmos. “Writing Rules.”

Modeling with Data, Parts 1 and 2

#### **Topic E: Geometric Modeling**

Lesson 4B.5.1: Two-Dimensional Cross Sections of Three-Dimensional Objects

Lesson 4B.5.2: Density

Lesson 4B.5.3: Design

#### **Conceptual Activities**

GeoGebra. “Sections of Cones.”

GeoGebra. “Sections of Cubes.”

GeoGebra. “Sections of Cylinders.”

GeoGebra. “Sections of Rectangular Pyramids.”

GeoGebra. “Sections of Spheres.”

GeoGebra. “Sections of Triangular Prisms.”

GeoGebra. “Sections of Triangular Pyramids.”

#### **Unit Review: Mathematical Modeling and Choosing a Model**

#### **Unit 4B Assessment**

#### **Station Activities**

Choosing a Model

Geometric Modeling

#### **End-of-Course Assessment**

#### **Problem-Based Task: Celebrating Black History**

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