

PROGRAM OVERVIEW

Table of Contents for Instructional Units

Unit 1: Extending the Number System

Topic A: Working with the Number System

Lesson 1.1.1: Defining, Rewriting, and Evaluating Rational Exponents

Lesson 1.1.2: Rational and Irrational Numbers and Their Properties

Conceptual Activities

GeoGebra. “Classifying Rational Numbers.”

GeoGebra. “Rational Exponents.”

Conceptual Tasks

Illustrative Mathematics. “Computations with Complex Numbers,” worksheets and teacher guide

Rational Decisions, Parts 1 and 2

Topic B: Operating with Polynomials

Lesson 1.2.1: Adding and Subtracting Polynomials

Lesson 1.2.2: Multiplying Polynomials

Conceptual Activity

GeoGebra. “Operations on Polynomials.”

Topic C: Operating with Complex Numbers

Lesson 1.3.1: Defining Complex Numbers, i , and i^2

Lesson 1.3.2: Adding and Subtracting Complex Numbers

Lesson 1.3.3: Multiplying Complex Numbers

Conceptual Activities

GeoGebra. “Addition of Complex Numbers.”

GeoGebra. “Algebra of Complex Numbers.”

Conceptual Task

Learning/Performance Task: Conceptual Task: Give Me an Operator, Parts 1 and 2

Unit Review: Extending the Number System

Unit 1 Assessment

Station Activities

Operations with Complex Numbers

Operations with Polynomials

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Unit 2: Quadratic Functions and Modeling

Topic A: Analyzing Quadratic Functions

Lesson 2.1.1: Graphing Quadratic Functions

Lesson 2.1.2: Interpreting Various Forms of Quadratic Functions

Conceptual Activities

Desmos. “Card Sort: Parabolas.”

GeoGebra. “The 3 forms of Quadratic functions.”

GeoGebra. “Graphing Quadratic Equations.”

Conceptual Task

Production Profit, Parts 1 and 2

Topic B: Interpreting Quadratic Functions

Lesson 2.2.1: Interpreting Key Features of Quadratic Functions

Lesson 2.2.2: Identifying the Domain of a Quadratic Function

Lesson 2.2.3: Identifying the Average Rate of Change

Conceptual Activities

Desmos. “Domain and Range Introduction.”

Desmos. “Free-Range Functions.”

GeoGebra. “Average Rate of Change.”

GeoGebra. “Average Rate of Change Intervals.”

GeoGebra. “Quadratic in Vertex form with Key Features.”

Conceptual Task

Firework Celebration, Parts 1 and 2

Topic C: Building Functions

Lesson 2.3.1: Building Functions from Context

Lesson 2.3.2: Function Operations

Conceptual Activity

GeoGebra. “Building Functions Graphically.”

Conceptual Task

Coffee Compensation, Parts 1 and 2

Topic D: Graphing Other Functions

Lesson 2.4.1: Square Root and Cube Root Functions

Lesson 2.4.2: Absolute Value and Step Functions

Lesson 2.4.3: Piecewise Functions

Conceptual Activities

Desmos. “Polygraph: Piecewise Functions.”

GeoGebra. “IRS Tax Function (2016) for Tax Payers Filing Single.”

GeoGebra. “Square Root Function.”

GeoGebra. “Step function explorer all parameters.”

Conceptual Task

Desmos. “Polygraph: Square Root Functions.”

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Topic E: Analyzing Functions

Lesson 2.5.1: Analyzing Exponential Functions

Lesson 2.5.2: Comparing Properties of Functions Given in Different Forms

Conceptual Activities

GeoGebra. “Exponential Functions: Graphs.”

GeoGebra. “Fastest Growing Function?”

Topic F: Transforming Functions

Lesson 2.6.1: Replacing $f(x)$ with $f(x) + k$ and $f(x + k)$

Lesson 2.6.2: Replacing $f(x)$ with $k \cdot f(x)$ and $f(k \cdot x)$

Conceptual Activities

Desmos. “Polygraph: Absolute Value.”

GeoGebra. “Function Transformations.”

Conceptual Task

This Curve You Can Change, Parts 1 and 2

Topic G: Finding Inverse Functions

Lesson 2.7.1: Finding Inverse Functions

Conceptual Activity

GeoGebra. “Inverse functions.”

Unit Review: Quadratic Functions and Modeling

Unit 2 Assessment

Station Activity

Graphing Quadratic Equations

Unit 3: Expressions and Equations

Topic A: Interpreting Structure in Expressions

Lesson 3.1.1: Identifying Terms, Factors, and Coefficients

Lesson 3.1.2: Interpreting Complicated Expressions

Conceptual Activity

GeoGebra. “Algebraic Expressions.”

Topic B: Creating and Solving Quadratic Equations in One Variable

Lesson 3.2.1: Taking the Square Root of Both Sides

Lesson 3.2.2: Factoring Expressions by the Greatest Common Factor

Lesson 3.2.3: Factoring Expressions with $a = 1$

Lesson 3.2.4: Factoring Expressions with $a > 1$

Lesson 3.2.5: Solving Quadratic Equations by Factoring

Lesson 3.2.6: Completing the Square

Lesson 3.2.7: Applying the Quadratic Formula

Lesson 3.2.8: Solving Quadratic Inequalities

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Conceptual Activities

Desmos. “Build a Bigger Field.”

GeoGebra. “Factoring Expressions Using Algebra Tiles (1).”

Conceptual Task

Solution Squabble, Parts 1 and 2

Topic C: Creating Quadratic Equations in Two or More Variables

Lesson 3.3.1: Creating and Graphing Equations Using Standard Form

Lesson 3.3.2: Creating and Graphing Equations Using the x -intercepts

Lesson 3.3.3: Creating and Graphing Equations Using Vertex Form

Lesson 3.3.4: Rearranging Formulas

Conceptual Activities

Desmos. “Match My Parabola.”

Desmos. “Penny Circle.”

GeoGebra. “The 3 forms of Quadratic functions.”

Conceptual Task

Toss Up, Parts 1 and 2

Topic D: Fundamental Theorem of Algebra

Lesson 3.4.1: Extending Polynomial Identities to Include Complex Numbers

Lesson 3.4.2: Solving Quadratic Equations with Complex Solutions

Conceptual Activity

GeoGebra. “Quadratic Equation: Complex Roots.”

Topic E: Rational Equations

Lesson 3.5.1: Creating Rational Equations

Lesson 3.5.2: Graphing Rational Equations

Lesson 3.5.3: Creating Rational Inequalities

Conceptual Activity

GeoGebra. “Explore Rational Functions.”

Conceptual Task

Cooking Up Rational Equations, Parts 1 and 2

Topic F: Writing Exponential Expressions in Equivalent Forms

Lesson 3.6.1: Writing Exponential Expressions in Equivalent Forms

Conceptual Activity

GeoGebra. “Exponential Growth & Decay (Illustrated Meaning).”

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Topic G: Solving Systems of Equations

Lesson 3.7.1: Solving Systems Graphically

Lesson 3.7.2: Solving Systems Algebraically

Conceptual Activity

GeoGebra. “The Evil Stepbrother.”

Unit Review: Expressions and Equations

Unit 3 Assessment

Station Activities

Factoring

Solving Quadratics

Quadratic Transformations in Vertex Form

Unit 4: Applications of Probability

Topic A: Events

Lesson 4.1.1: Describing Events

Lesson 4.1.2: The Addition Rule

Lesson 4.1.3: Understanding Independent Events

Conceptual Activity

GeoGebra. “Set theory.”

Conceptual Task

Gym Survey Analysis, Parts 1 and 2

Topic B: Conditional Probability

Lesson 4.2.1: Introducing Conditional Probability

Lesson 4.2.2: Using Two-Way Frequency Tables

Lesson 4.2.3: The Multiplication Rule

Conceptual Activities

GeoGebra. “Conditional probability.”

Illustrative Mathematics. “The Titanic 3.”

Conceptual Tasks

Allergies and Probabilities, Parts 1 and 2

Mathematics Assessment Resource Service, University of Nottingham. “Representing Conditional Probabilities 1.”

Topic C: Combinatorics

Lesson 4.3.1: Combinations and Permutations

Lesson 4.3.2: Probability with Combinatorics

Conceptual Activity

GeoGebra. “Permutation of different cards (distinguishable objects).”

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Topic D: Decision Making with Probability (Making and Analyzing Decisions)

Lesson 4.4.1: Determining Fairness (Making Decisions)

Lesson 4.4.2: Making Decisions Using Probability (Analyzing Decisions)

Unit Review: Applications of Probability

Unit 4 Assessment

Station Activities

Probability

Unit 5: Similarity, Right Triangle Trigonometry, and Proof

Topic A: Line Segments

Lesson 5.1.1: Midpoints and Other Points on Line Segments

Topic B: Investigating Properties of Dilations

Lesson 5.2.1: Investigating Properties of Parallelism and the Center

Lesson 5.2.2: Investigating Scale Factors

Conceptual Activity

GeoGebra. “Dilation Exploration.”

Topic C: Defining and Applying Similarity

Lesson 5.3.1: Defining Similarity

Lesson 5.3.2: Applying Similarity Using the Angle-Angle (AA) Criterion

Conceptual Activity

GeoGebra. “Similar Figures: Dynamic Illustration.”

Conceptual Task

Similarity Investigation, Parts 1 and 2

Topic D: Proving Similarity

Lesson 5.4.1: Proving Triangle Similarity Using Side-Angle-Side (SAS) and Side-Side-Side (SSS) Similarity

Lesson 5.4.2: Working with Ratio Segments

Lesson 5.4.3: Proving the Pythagorean Theorem Using Similarity

Lesson 5.4.4: Solving Problems Using Similarity and Congruence

Conceptual Activity

GeoGebra. “Prove Similarity Theorems.”

Topic E: Proving Theorems About Lines and Angles

Lesson 5.5.1: Proving the Vertical Angles Theorem

Lesson 5.5.2: Proving Theorems About Angles in Parallel Lines Cut by a Transversal

Conceptual Activities

Desmos. “Lines, Transversals, and Angles.”

Desmos. “Polygraph: Angle Relationships.”

Desmos. “Polygraph: Figure It Out.”

GeoGebra. “Vertical Angles: Quick Exploration.”

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Conceptual Task

Triangulating a Waterspout, Parts 1 and 2

Topic F: Proving Theorems About Triangles

Lesson 5.6.1: Proving the Interior Angle Sum Theorem

Lesson 5.6.2: Proving Theorems About Isosceles Triangles

Lesson 5.6.3: Proving the Midsegment of a Triangle

Lesson 5.6.4: Proving Centers of Triangles

Conceptual Activity

GeoGebra. “Triangle Angle Theorems.”

Conceptual Task

String Games, Parts 1 and 2

Topic G: Proving Theorems About Parallelograms

Lesson 5.7.1: Proving Properties of Parallelograms

Lesson 5.7.2: Proving Properties of Special Quadrilaterals

Conceptual Activity

GeoGebra. “Parallelogram: Theorem 1.”

Topic H: Exploring Trigonometric Ratios

Lesson 5.8.1: Defining Trigonometric Ratios

Lesson 5.8.2: Exploring Sine and Cosine As Complements

Conceptual Activity

GeoGebra. “Right Triangle Trigonometry: Intro.”

Topic I: Applying Trigonometric Ratios

Lesson 5.9.1: Calculating Sine, Cosine, and Tangent

Lesson 5.9.2: Calculating Cosecant, Secant, and Cotangent

Lesson 5.9.3: Problem Solving with the Pythagorean Theorem and Trigonometry

Lesson 5.9.4: Proving the Fundamental Pythagorean Identity

Conceptual Activity

GeoGebra. “How Fast are You Spinning?”

Conceptual Task

Triangles? Yeah, Right, Parts 1 and 2

Unit Review: Similarity, Right Triangle Trigonometry, and Proof

Unit 5 Assessment

Station Activities

Similarity and Scale Factor

Parallel Lines and Transversals

Rhombi, Squares, Kites, and Trapezoids

Sine, Cosine, and Tangent Ratios, and Angles of Elevation and Depression

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Unit 6: Circles With and Without Coordinates

Topic A: Introducing Circles

Lesson 6.1.1: Similar Circles and Central and Inscribed Angles

Lesson 6.1.2: Chord Central Angles Conjecture

Lesson 6.1.3: Properties of Tangents of a Circle

Conceptual Activity

GeoGebra. “Similar Circles?”

Conceptual Task

Moon Horizons, Parts 1 and 2

Topic B: Inscribed Polygons and Circumscribed Triangles

Lesson 6.2.1: Constructing Inscribed Circles

Lesson 6.2.2: Constructing Circumscribed Circles

Lesson 6.2.3: Proving Properties of Inscribed Quadrilaterals

Conceptual Activity

GeoGebra. “Circumcircle: Construction Exercise (VA).”

Conceptual Task

Circle Constructions, Parts 1 and 2

Topic C: Constructing Tangent Lines

Lesson 6.3.1: Constructing Tangent Lines

Conceptual Activity

“Tangent to Circle: Construction 1.”

Topic D: Finding Arc Lengths and Areas of Sectors

Lesson 6.4.1: Defining Radians

Lesson 6.4.2: Deriving the Formula for the Area of a Sector

Conceptual Activities

Desmos. “Sector Area.”

GeoGebra. “Movie: Radians to Revs.”

Conceptual Task

Circle Investigation, Parts 1 and 2

Topic E: Explaining and Applying Area and Volume Formulas

Lesson 6.5.1: Circumference and Area of a Circle

Lesson 6.5.2: Volumes of Cylinders, Pyramids, Cones, and Spheres

Conceptual Activity

GeoGebra. “Circumference = ? (Animation).”

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Topic F: Deriving Equations

Lesson 6.6.1: Deriving the Equation of a Circle

Lesson 6.6.2: Deriving the Equation of a Parabola

Conceptual Activities

Desmos. “Equations of Circles.”

GeoGebra. “Circle Equation: Center NOT (0, 0).”

Topic G: Using Coordinates to Prove Geometric Theorems About Circles and Parabolas

Lesson 6.7.1: Using Coordinates to Prove Geometric Theorems About Circles and Parabolas

Conceptual Activities

Desmos. “Polygraph: Parabolas.”

GeoGebra. “Conic Sections.”

Unit Review: Circles With and Without Coordinates

Unit 6 Assessment

Station Activities

Circumference, Angles, Arcs, Chords, and Inscribed Angles

Special Segments, Angle Measurements, and Equations of Circles

Circumcenter, Incenter, Orthocenter, and Centroid

End-of-Course Assessment

Problem-Based Task: Celebrating Black History