

## PROGRAM OVERVIEW

# Table of Contents for Instructional Units

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### **Unit 1: Congruence, Proof, and Constructions**

#### **Topic A: Introducing Transformations**

Defining Terms

Transformations As Functions

Applying Lines of Symmetry

#### **Conceptual Activities**

Desmos. “Polygraph: Transformations.”

GeoGebra. “Draw (a) line of symmetry.”

#### **Topic B: Defining and Applying Rotations, Reflections, and Translations**

Defining Rotations, Reflections, and Translations

Applying Rotations, Reflections, and Translations

#### **Conceptual Activity**

GeoGebra. “Reflections, Rotations, Dilations, and Translations.”

#### **Conceptual Task**

The Transforming Key, Parts 1 and 2

#### **Topic C: Exploring Congruence**

Describing Rigid Motions and Predicting the Effects

Defining Congruence in Terms of Rigid Motions

#### **Conceptual Activity**

GeoGebra. “Congruence by Rigid Motions.”

#### **Conceptual Task**

Transformation Tests, Parts 1 and 2

#### **Topic D: Congruent Triangles**

Triangle Congruency

Explaining ASA, SAS, and SSS

#### **Conceptual Activity**

GeoGebra. “Congruence of triangles.”

#### **Conceptual Task**

Decoration Dilemma, Parts 1 and 2

#### **Topic E: Proving Theorems About Lines and Angles**

Proving the Vertical Angles Theorem

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**

Proving the Interior Angle Sum Theorem

Proving Theorems About Isosceles Triangles

Proving the Midsegment of a Triangle

Proving Centers of Triangles

#### **Conceptual Activity**

GeoGebra. "Triangle Angle Theorems."

#### **Conceptual Task**

String Games, Parts 1 and 2

#### **Topic G: Proving Theorems About Parallelograms**

Proving Properties of Parallelograms

Proving Properties of Special Quadrilaterals

#### **Conceptual Activity**

GeoGebra. "Parallelogram: Theorem 1."

#### **Topic H: Constructing Lines, Segments, and Angles**

Copying Segments and Angles

Bisecting Segments and Angles

Constructing Perpendicular and Parallel Lines

#### **Conceptual Activities**

GeoGebra. "Basic Constructions."

GeoGebra. "Constructing Parallel and Perpendicular Lines."

#### **Topic I: Constructing Polygons**

Constructing Equilateral Triangles Inscribed in Circles

Constructing Squares Inscribed in Circles

Constructing Regular Hexagons Inscribed in Circles

#### **Conceptual Activities**

GeoGebra. "Equilateral Triangle Construction (Dynamic Illustration)."

GeoGebra. "Construct Equilateral Triangle Inscribed in a Circle."

GeoGebra. "Hexagon-Construction."

#### **Unit Assessment**

#### **Station Activities**

Rotations and Reflections

Corresponding Parts, Transformations, and Proof

Rhombi, Squares, Kites, and Trapezoids

Circumcenter, Incenter, Orthocenter, and Centroid

Parallel Lines and Transversals

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#### **Unit 2: Similarity, Proof, and Trigonometry**

##### **Topic A: Investigating Properties of Dilations**

Investigating Properties of Parallelism and the Center

Investigating Scale Factors

##### **Conceptual Activity**

GeoGebra. “Dilation Exploration.”

##### **Topic B: Defining and Applying Similarity**

Defining Similarity

Applying Similarity Using the Angle-Angle (AA) Criterion

##### **Conceptual Activity**

GeoGebra. “Similar Figures: Dynamic Illustration.”

##### **Conceptual Task**

Similarity Investigation, Parts 1 and 2

##### **Topic C: Proving Similarity**

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

Working with Ratio Segments

Proving the Pythagorean Theorem Using Similarity

Solving Problems Using Similarity and Congruence

##### **Conceptual Activity**

GeoGebra. “Prove Similarity Theorems.”

##### **Topic D: Exploring Trigonometric Ratios**

Defining Trigonometric Ratios

Exploring Sine and Cosine As Complements

##### **Conceptual Activity**

GeoGebra. “Right Triangle Trigonometry: Intro.”

##### **Topic E: Applying Trigonometric Ratios**

Calculating Sine, Cosine, and Tangent

Calculating Cosecant, Secant, and Cotangent

Problem Solving with the Pythagorean Theorem and Trigonometry

##### **Conceptual Activity**

GeoGebra. “How Fast are You Spinning?”

##### **Conceptual Task**

Triangles? Yeah, Right, Parts 1 and 2

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

Proving the Law of Sines

Proving the Law of Cosines

Applying the Laws of Sines and Cosines

#### **Unit Assessment**

#### **Station Activities**

Similarity and Scale Factor

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

The Laws of Sines and Cosines

### **Unit 3: Extending to Three Dimensions**

#### **Topic A: Explaining and Applying Area and Volume Formulas**

Circumference and Area of a Circle

Volumes of Cylinders, Pyramids, Cones, and Spheres

#### **Conceptual Activity**

GeoGebra. “Circumference = ? (Animation).”

#### **Topic B: Two-Dimensional Cross Sections of Three-Dimensional Objects**

Two-Dimensional Cross Sections of Three-Dimensional Objects

#### **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 Assessment**

#### **Station Activity**

Geometric Modeling

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#### **Unit 4: Connecting Algebra and Geometry Through Coordinates**

##### **Topic A: Slope and Distance**

Using Coordinates to Prove Geometric Theorems with Slope and Distance

Working with Parallel and Perpendicular Lines

##### **Conceptual Activities**

GeoGebra. “Writing the Equation of Line from Graph in Slope-Intercept Form.”

GeoGebra. “Distance Formula.”

GeoGebra. “Parallel Lines.”

##### **Conceptual Task**

The Town Square, Parts 1 and 2

##### **Topic B: Points on Line Segments**

Midpoints and Other Points on Line Segments

##### **Topic C: Calculating Perimeter and Area**

Calculating Perimeter and Area

##### **Conceptual Activities**

GeoGebra. “Triangle Area Warmup.”

GeoGebra. “Perimeter of Triangles on the Coordinate Grid.”

##### **Topic D: Defining Parabolas Geometrically**

Deriving the Equation of a Parabola

##### **Conceptual Activities**

Desmos. “Polygraph: Parabola-Focus-Directrix.”

GeoGebra. “Conic Sections.”

##### **Unit Assessment**

##### **Station Activities**

Parallel Lines, Slopes, and Equations

Perpendicular Lines

Coordinate Proof with Quadrilaterals

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#### **Unit 5: Circles With and Without Coordinates**

##### **Topic A: Introducing Circles**

Similar Circles and Central and Inscribed Angles

Chord Central Angles Conjecture

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**

Constructing Inscribed Circles

Constructing Circumscribed Circles

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**

Constructing Tangent Lines

##### **Conceptual Activity**

“Tangent to Circle: Construction 1.”

##### **Topic D: Finding Arc Lengths and Areas of Sectors**

Defining Radians

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: The Equation of a Circle**

Deriving the Equation of a Circle

Using Coordinates to Prove Geometric Theorems About Circles

##### **Conceptual Activities**

Desmos. “Equations of Circles.”

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

##### **Topic F: Geometric Modeling with Circles**

Modeling with Circles

##### **Conceptual Activity**

Desmos. “Circle Patterns.”

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#### **Unit Assessment**

#### **Station Activities**

Circumference, Angles, Arcs, Chords, and Inscribed Angles

Special Segments, Angle Measurements, and Equations of Circles

### **Unit 6: Applications of Probability**

#### **Topic A: Events**

Describing Events

The Addition Rule

Understanding Independent Events

#### **Conceptual Activity**

GeoGebra. “Set theory.”

#### **Conceptual Task**

Gym Survey Analysis, Parts 1 and 2

#### **Topic B: Conditional Probability**

Introducing Conditional Probability

Using Two-Way Frequency Tables

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**

Combinations and Permutations

Probability with Combinatorics

#### **Conceptual Activity**

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

#### **Topic D: Making Decisions**

Making Decisions

Analyzing Decisions

#### **Unit Assessment**

#### **Station Activity**

Probability