

## Correlation of *Discovering Geometry* to the Oklahoma State's Priority Academic Student Skills (PASS)

### INTRODUCTION

*Discovering Geometry: An Investigative Approach* is a revolutionary and exciting geometry textbook. Using an inductive approach, students learn geometry through investigation and observation. They strengthen these geometry concepts by proving their findings deductively. This is a departure from traditional texts, which place heavy emphasis on drill and practice and rote memorization and rush their presentation of proof.

The text is consistent with current research in the development of geometric thinking, especially the model advocated in the van Hiele five-step approach to geometry education. With this in mind, the concepts for proofs are gradually developed as students work through the text. Students first master concepts and relationships. They develop spatial thinking and inductive reasoning skills through hands-on investigations, making conjectures and testing their ideas. Students learn to follow algebraic, paragraph, and flowchart proofs. No other book develops such appreciation and understanding of the proof process.

Now in its third edition, *Discovering Geometry* incorporates the latest, best ideas from teachers who used the second edition. Formal proof is now built up gradually, from explaining why, to paragraph proofs, flowchart proofs, and 2-column proofs. With logic now woven throughout the text, students will continue to learn geometry through an investigative approach, but they will also then use deductive reasoning to examine and explain their discoveries as they make them. "Using Your Algebra Skills" provides regular algebra review and practice in short lesson format. Also, more applications are called out in lessons and exercises to help students realize

the impact of mathematics on their everyday lives and future careers.

*Discovering Geometry* continues to take advantage of up-to-date technology. The Geometer's Sketchpad® projects and "Graphing Calculator Investigations" provide enrichment activities for technology enthusiasts. Students use a variety of investigative tools, from patty papers (wax paper squares) to compass and straightedge to state-of-the-art computer technology. Students can follow up their investigations in open-ended ways with "Take Another Look" activities in which they can justify, extend, communicate, and assess their understanding of their findings. A section entitled "Assessing What You've Learned" aids students in understanding various assessment techniques as well as in developing good self-assessment and study habits.

Teachers using *Discovering Geometry* find it so comprehensive that it can be used in a variety of ways in different types of geometry classes. A new hard-bound *Teacher's Edition* with wrap-around presentation provides page-by-page notes in a coherent narrative of how to teach the material. A new pacing guide helps teachers to teach the material at three different levels. Individual teachers using *Discovering Geometry*, therefore, will find it easy to adapt their course to best meet their students' needs. The *Teacher's Edition* also provides a section with suggestions from author Michael Serra for incorporating cooperative learning in the classroom. Following that is a section of suggestions for assessment, including ideas from teachers who've had success with innovative assessment alternatives.



## Correlation of *Discovering Geometry* to the Oklahoma PASS

### INTRODUCTION

*Discovering Geometry* comes with a full line of ancillary support materials, including a *Solutions Manual* and *Teaching and Worksheets Masters*. The ancillary Practice Your Skills is available in a blackline master version with answers (for teachers) and a consumable version without answers (for students). *Condensed Lessons for Make-Up Work* provides resources for getting absent students up to speed without sacrificing discovery-based learning. The *Assessment Resources* ancillaries include forms A and B of all quizzes, tests, and exams. These also feature constructive assessment options, allowing teachers to test for deeper understanding and customize exams and

quizzes with special problems depending on class level. *Discovering Geometry with The Geometer's Sketchpad®* and *Demonstrations with The Geometer's Sketchpad®* incorporate Sketchpad™ in making alternate versions of lessons and in-class demonstrations of geometry topics. *More Projects and Explorations* will allow teachers to choose from an array of full-length activities new to the Third Edition and some favorites from earlier editions. Finally, a full line of electronic ancillary products includes an electronic *Test Generator and Worksheet Builder and Teaching Resources on CD*.



## Oklahoma PASS Standard 1: Logical Reasoning

Standard	Expectation	<i>Discovering Geometry</i> Correlation
<p>The student will use deductive and inductive reasoning to solve problems.</p>	<p>1. Properties and Relationships of Figures</p> <p>a. Identify the relationships of parallel lines with a transversal.</p>	<p><b>Chapter 2: Reasoning in Geometry</b>            2.5: Angle Relationships            2.6: Special Angles on Parallel Lines</p> <p><b>Chapter 3: Using Tools of Geometry</b>            Using Your Algebra Skills 3: Slopes of Parallel and Perpendicular Lines</p>
	<p>b. Identify relationships between pairs of angles (e.g., adjacent, complementary, vertical).</p>	<p><b>Chapter 4: Discovering and Proving Triangle Properties</b>            4.3: Triangle Inequalities</p> <p><b>Chapter 5: Discovering &amp; Proving Polygon Properties</b>            All Lessons</p> <p><b>Chapter 13: Geometry as a Mathematical System</b>            13.2: Planning a Geometry Proof</p>
	<p>2. Determine and use the relationships of congruency and similarity to determine unknown values.</p>	<p><b>Chapter 4: Discovering and Proving Triangle Properties</b>            4.4: Are There Congruency Shortcuts            4.5: Are There Others Congruency Shortcuts            4.6: Corresponding Parts of Congruent Triangles            4.7: Flowchart Thinking            4.8: Proving Isosceles Triangle Conjectures</p> <p><b>Chapter 11: Similarity</b>            11.2: Similar Triangles            11.3: Indirect Measurement with Similar Triangles            11.4: Corresponding Parts of Similar Triangles</p>



Standard	Expectation	<i>Discovering Geometry Correlation</i>
<p>The student will use deductive and inductive reasoning to solve problems. (con'd.)</p>	<p>2. Determine and use the relationships of congruency and similarity to determine unknown values. (cont'd.)</p> <hr/> <p>3. Use logical reasoning skills (inductive and deductive) to make and test conjectures, formulate counter examples, follow arguments, judge the validity of arguments and construct simple valid arguments.</p>	<p><b>Chapter 13: Geometry as a Mathematical System</b>          13.3: Triangle Proofs          13.7: Similarity Proofs</p> <hr/> <p><b>Chapter 1: Introducing Geometry</b>          1.3: What's a Widget</p> <p><b>Chapter 2: Reasoning in Geometry</b>          2.1: Inductive Reasoning          2.2: Deductive Reasoning          2.4: Mathematical Modeling</p> <p><b>Chapter 10: Volume</b>          Exploration: Sherlock Holmes and Forms of Valid Reasoning</p> <p><b>Chapter 11: Similarity</b>          Exploration: Two More Forms of Valid Reasoning</p> <p><b>Chapter 13: Geometry as a Mathematical System</b>          13.1: The Premises of Geometry</p>

## Oklahoma PASS

### Standard 2: Properties of 2- and 3- Dimensional Figures

Standard	Expectation	<i>Discovering Geometry</i> Correlation
<p>The student will use the properties and formulas of geometric figures to solve problems.</p>	<p>1. Polygons</p> <p>a. Identify and describe polygons (i.e., convex, concave, regular)</p>	<p><b>Chapter 1: Introducing Geometry</b> All Lessons</p> <p><b>Chapter 4: Discovering and Proving Triangle Properties</b> All Lessons</p> <p><b>Chapter 5: Discovering &amp; Proving Polygon Properties</b> All Lessons</p>
	<p>b. Apply the interior and exterior angle sum of convex polygons to solve problems.</p>	<p><b>Chapter 1: Introducing Geometry</b>            1.1: Building Blocks of Geometry            1.2: Poolroom Math            1.3: What's a Widget</p>
	<p>c. Develop and apply the properties of quadrilaterals to solve problems (e.g., rectangles, parallelograms, rhombi, trapezoids, kites).</p>	<p><b>Chapter 4: Discovering and Proving Triangle Properties</b>            4.1: Triangle Sum Conjecture            4.2: Properties of Special Triangles</p> <p><b>Chapter 5: Discovering &amp; Proving Polygon Properties</b>            5.1: Polygon Sum Conjecture            5.2: Exterior Angles of a Polygon            5.4: Properties of Midsegments            5.5: Properties of Parallelograms            5.6: Properties of Special Parallelograms            5.7: Proving Quadrilateral Properties</p> <p><b>Chapter 13: Geometry as a Mathematical System</b>            13.4: Quadrilateral Proofs            Using Algebra Skills 10: Coordinate Proof</p>



Standard	Expectation	<i>Discovering Geometry Correlation</i>
<p>The student will use the properties and formulas of geometric figures to solve problems. (cont'd.)</p>	<p>2. Draw and analyze 2- and 3-dimensional figures.</p> <hr/> <p>3. Use properties of 2- and 3-dimensional figures to determine unknown values (e.g., given the perimeter/circumference, find the area).</p>	<p><b>Chapter 1: Introducing Geometry</b>          1.1: Building Blocks of Geometry          1.8: Space Geometry</p> <p><b>Chapter 9: The Pythagorean Theorem</b>          9.2: The Converse of the Pythagorean Theorem          9.3: Two Special Right Triangles</p> <p><b>Chapter 10: Volume</b>          Exploration: The Five Platonic Solids          Exploration: Orthographic Drawing          10.7: Surface Area of a Sphere</p> <hr/> <p><b>Chapter 5: Discovering &amp; Proving Polygon Properties</b>          5.3: Kite and Trapezoid Properties</p> <p><b>Chapter 6: Discovering and Proving Circle Properties</b>          6.5: The Circumference/Diameter Ratio</p> <p><b>Chapter 8: Area</b>          8.1: Areas of Rectangles and Parallelograms          8.2: Areas of Triangles          8.4: Areas of Regular Polygons          8.5: Areas of Circles          8.6: Any way You Slice It</p> <p><b>Chapter 10: Volume</b>          10.6: Volume of a Sphere</p>



Standard	Expectation	<i>Discovering Geometry Correlation</i>
<p>The student will use the properties and formulas of geometric figures to solve problems. (cont'd.)</p>	<p>4. Compute length, perimeter or circumference, area, volume, and surface area of geometric figures with missing information and correctly identify the appropriate unit of measure of each.</p>	<p><b>Chapter 5: Discovering &amp; Proving Polygon Properties</b>            5.3: Kite and Trapezoid Properties            5.4: Properties of Midsegments            5.5: Properties of Parallelograms</p> <p><b>Chapter 6: Discovering and Proving Circle Properties</b>            6.5: The Circumference/Diameter Ratio            6.6: Around the World            6.7: Arc Length</p> <p><b>Chapter 8: Area</b>            8.1: Areas of Rectangles and Parallelograms            8.2: Areas of Triangles            8.3: Area Problems            8.4: Areas of Regular Polygons            8.5: Areas of Circles            8.6: Any way You Slice It            8.7: Surface Area</p> <p><b>Chapter 9: The Pythagorean Theorem</b>            9.3: Two Special Right Triangles</p> <p><b>Chapter 10: Volume</b>            10.2: Volume of Prisms and Cylinders            10.3: Volume of Pyramids and Cones            10.5: Displacement and Density            10.6: Volume of a Sphere            10.7: Surface Area of a Sphere</p>



Standard	Expectation	<i>Discovering Geometry Correlation</i>
<p>The student will use the properties and formulas of geometric figures to solve problems. (cont'd.)</p>	<p>5. Use geometric tools (e.g., protractor, compass, straightedge) to construct a variety of figures.</p>	<p><b>Chapter 3: Using Tools of Geometry</b>            3.1: Duplicating Segments and Angles            3.2: Constructing Perpendicular Bisectors            3.3: Constructing Perpendiculars to a Line            3.4: Constructing Angle Bisectors            3.5: Constructing Parallel Lines            3.6: Construction Problems            3.7: Constructing Points of Concurrency            3.8: The Centroid</p>
	<p>6. Find angle measures and arc measures related to circles.</p>	<p><b>Chapter 1: Introducing Geometry</b>            1.6: Circles</p> <p><b>Chapter 6: Discovering and Proving Circle Properties</b>            6.1: Chord Properties            6.2: Tangent Properties            6.3: Arcs and Angles            6.4: Proving Circle Conjectures            6.5: The Circumference/Diameter Ratio            6.6: Around the World            6.7: Arc Length</p> <p><b>Chapter 13: Geometry as a Mathematical System</b>            13.6: Circle Proofs</p>
	<p>7. Chords, Secants and Tangents</p> <p>a. Identify and describe the relationship between two chords that intersect in the interior of a circle.</p>	<p><b>Chapter 6: Discovering and Proving Circle Properties</b>            6.1: Chord Properties            6.3: Arcs and Angles            6.5: The Circumference/Diameter Ratio            6.6: Around the World</p> <p><b>Chapter 11: Similarity</b>            11.3: Indirect Measurement with Similar Triangles</p>



Standard	Expectation	<i>Discovering Geometry</i> Correlation
<p>The student will use the properties and formulas of geometric figures to solve problems. (cont'd.)</p>	<p>b. Identify and describe the relationship between two secants that intersect in the exterior of a circle.</p> <hr/> <p>c. Identify and describe the relationship between a secant and a tangent that intersect in the exterior of a circle.</p>	<p><b>Chapter 6: Discovering and Proving Circle Properties</b>          6.6: Around the World</p> <hr/> <p><b>Chapter 6: Discovering and Proving Circle Properties</b>          6.2: Tangent Properties</p>



## Oklahoma PASS Standard 3: Coordinate Geometry

Standard	Expectation	<i>Discovering Geometry</i> Correlation
<p>The student will solve problems with geometric figures in the coordinate plane. (cont'd.)</p>	<p>1. Use transformations (reflection, rotation, translation) within coordinate geometry (e.g., reflect points across the y-axis)</p> <hr/> <p>2. Use coordinate geometry to find the distance between two points; the midpoint of a segment' and to calculate the slopes of parallel, perpendicular, horizontal, and vertical lines.</p>	<p><b>Chapter 7: Transformations and Tessellations</b>          7.1: Transformations and Symmetry          7.2: Properties of Isometries          7.3: Compositions of Transformations</p> <hr/> <p><b>Chapter 1: Introducing Geometry</b>          Using your Algebra Skills 1: Midpoint</p> <p><b>Chapter 2: Reasoning in Geometry</b>          Using Your Algebra Skills 2: Slope</p> <p><b>Chapter 3: Using Tools of Geometry</b>          Using Your Algebra Skills 3: Slopes of Parallel and Perpendicular Lines</p> <p><b>Chapter 4: Discovering and Proving Triangle Properties</b>          Using Your Algebra Skills 4: Writing Linear Equations</p> <p><b>Chapter 9: The Pythagorean Theorem</b>          9.5: Distance in Coordinate Geometry          9.6: Circles and the Pythagorean Theorem</p> <p><b>Chapter 13: Geometry as a Mathematical System</b>          Using Algebra Skills 10: Coordinate Proof</p>



Standard	Expectation	<i>Discovering Geometry</i> Correlation
<p>The student will solve problems with geometric figures in the coordinate plane. (cont'd.)</p>	<p>3. Given a set of points determine the type of figure based on its properties (e.g., parallelogram, isosceles triangle, regular octagon).</p>	<p><b>Chapter 3: Using Tools of Geometry</b>          Using Your Algebra Skills 3: Slopes of Parallel and Perpendicular Lines</p> <p><b>Chapter 9: The Pythagorean Theorem</b>          9.5: Distance in Coordinate Geometry</p> <p><b>Chapter 13: Geometry as a Mathematical System</b>          Using Algebra Skills 10: Coordinate Proof</p>



## Oklahoma PASS Standard 4: Angles, Triangles, and Similar Polygons

Standard	Expectation	<i>Discovering Geometry</i> Correlation
<p>The student will use the properties of angles, right triangles and similar polygons to solve problems.</p>	<p>1. Solve problems using properties of angles (e.g., interior, exterior, complementary, vertical, angle sums, 30-60-90).</p>	<p><b>Chapter 1: Introducing Geometry</b>            All Lessons</p> <p><b>Chapter 4: Discovering and Proving Triangle Properties</b>            4.1: Triangle Sum Conjecture            4.2: Properties of Special Triangles</p> <p><b>Chapter 5: Discovering &amp; Proving Polygon Properties</b>            5.1: Polygon Sum Conjecture            5.2: Exterior Angles of a Polygon            5.4: Properties of Midsegments            5.5: Properties of Parallelograms            5.6: Properties of Special Parallelograms</p> <p><b>Chapter 9: The Pythagorean Theorem</b>            9.3: Two Special Right Triangles</p>
	<p>2. Use the Pythagorean Theorem and its converse to find missing side lengths and to determine acute, right, and obtuse triangles.</p>	<p><b>Chapter 9: The Pythagorean Theorem</b>            9.1: The Theorem of Pythagoras            9.2: The Converse of the Pythagorean Theorem            9.4: Story Problems            9.5: Distance in Coordinate Geometry            9.6: Circles and the Pythagorean Theorem</p>
	<p>3. Apply the 45-45-90 and 30-60-90 right triangle relationships to solve problems.</p>	<p><b>Chapter 9: The Pythagorean Theorem</b>            9.3: Two Special Right Triangles</p>



Standard	Expectation	<i>Discovering Geometry</i> Correlation
<p>The student will use the properties of angles, right triangles and similar polygons to solve problems. (cont'd.)</p>	<p>4. Express the trigonometric functions as ratios and derive the relationship between sine, cosine, and tangent ratios, and use to solve real-world problems.</p>	<p><b>Chapter 12: Trigonometry</b>            12.1: Trigonometric Ratios            12.2: Problem Solving with Right Triangles            12.3: The Law of Sines            12.4: The Law of Cosines            12.5: Problem Solving with Trigonometry</p>
	<p>5. Similar Polygons</p> <p>a. Use similar figures to construct ratios and solve for a missing side.</p>	<p><b>Chapter 4: Discovering and Proving Triangle Properties</b>            4.8: Proving Isosceles Triangle Conjectures</p> <p><b>Chapter 11: Similarity</b>            11.2: Similar Triangles            11.3: Indirect Measurement with Similar Triangles            11.4: Corresponding Parts of Similar Triangles</p>
	<p>b. Use ratios of similar figures to find linear distance, perimeter, area, and volume.</p>	<p><b>Chapter 11: Similarity</b>            11.4: Corresponding Parts of Similar Triangles            11.5: Proportions with Area and Volume</p>