

## Correlation of the Alabama Geometry Standards with *Discovering Geometry: An Investigative Approach*

### 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.

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 verbal explanation, 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* presents a comprehensive study of Geometry. Fundamental concepts are introduced in the first four chapters; Chapter 0: Geometric Art, Chapter 1: Introducing Geometry, Chapter 2: Reasoning in Geometry, and Chapter 3: Using Tools of Geometry. In this section of the text, students learn to distinguish among lines, rays, and segments, and to measure and classify angles. There is also much opportunity to learn and practice geometric constructions. In this section, the term “Euclidean Geometry” is introduced and explained. Students discover and apply postulates and theorems related to parallel and perpendicular lines and their slopes. This section of *Discovering Geometry* defines parts of circles, including the incenter, circumcenter, and centroid. Students apply formulas of coordinate geometry and find the slope of a line. Inductive and deductive reasoning are introduced in this part of the text and are used throughout the book.

In the second section of *Discovering Geometry*, students learn properties of two-dimensional shapes. Chapter 4: Discovering and Proving Triangle Properties, Chapter 5: Discovering and Proving Polygon Properties, Chapter 6: Discovering and Proving Circle Properties, and Chapter 7: Transformations and Tessellations provide students with ample opportunity to determine area and circumference of a circle, determine arc length, and demonstrate reflections, translations, and rotations. Students learn to apply properties of measure associated with triangles and quadrilaterals (including the Triangle Inequality Theorem.) They deduce the measure of angles associated with polygons. Students, in this part of the text, also learn about congruence of triangles and apply properties of circles.



Chapters 9, 11, and 12 (The Pythagorean Theorem, Similarity, and Trigonometry, respectively) provide a more in-depth study of triangles and polygons. In this section, students use the formulas of coordinate geometry, apply the Pythagorean theorem, including the use of Pythagorean triples, and use the properties of 30-60-90 and 45-45-90 triangles. In the Similarity and Trigonometry chapters, students make use of ratio and proportion to solve problems and learn the right triangle definitions of sine, cosine, and tangent.

In Chapters 8 and 10, students explore Area and Volume. They find the area of polygons, as well as surface area and volume of cylinders, spheres, and prisms. The text introduces polyhedrons and describes the locus that defines a sphere. *Discovering Geometry* concludes with Chapter 13: Geometry as a Mathematical System, in which students fine-tune their proof-writing skills. This chapter further explores the fundamental propositions of Euclidean geometry, teaches students how to plan a proof, and summarizes many of the algebraic and geometric postulates used throughout the text.

*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.

*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*.

## Alabama Geometry Standards Number Sense, Number Systems, Number Theory

### Content Standards

1. Construct line segments whose lengths are irrational.

### *Discovering Geometry* Correlation

- Chapter 11: Similarity**  
11.3: Indirect Measurements with Similar Triangles (P.585, #17)

## Alabama Geometry Standards Geometry, Spatial Sense, Measurement

### Content Standards

2. Demonstrate an understanding of the term, "Euclidean geometry," and the fundamental proposition of Euclidean geometry.

3. Distinguish among lines, rays, and segments.

4. Measure and classify angles.

5. Determine area and circumference of a circle.

6. Determine arc length.

### *Discovering Geometry* Correlation

- Chapter 3: Using Tools of Geometry**  
3.1: Duplicating Segments and Angles  
**Chapter 13: Geometry as a Mathematical System**  
13.1: The Premises of Geometry Exploration: Non- Euclidean Geometries

- Chapter 1: Introducing Geometry**  
1.1: Building Blocks of Geometry  
**Chapter 6: Discovering and Proving Circle Properties**  
6.1: Chord Properties  
6.2: Tangent Properties

- Chapter 1: Introducing Geometry**  
1.2: Poolroom Math  
1.3: What's a Widget?  
**Chapter 2: Reasoning in Geometry**  
2.5: Angle Relationships  
2.6: Special Angles on Parallel Lines  
**Chapter 5: Discovering and Proving Polygon Properties**  
5.1: Polygon Sum Conjecture  
5.2: Exterior Angles of a Polygon  
5.3: Kite and Trapezoid Properties  
5.5: Properties of Parallelograms  
5.6: Properties of Special Parallelograms

- Chapter 6: Discovering and Proving Circle Properties**  
6.5: The Circumference/Diameter Ratio  
6.6: Around the World  
6.7: Arc Length

- Chapter 8: Area**  
8.5: Areas of Circles  
8.6: Any Way You Slice It  
**Chapter 9: The Pythagorean Theorem**  
9.6: Circles and the Pythagorean Theorem

- Chapter 6: Discovering and Proving Circle Properties**  
6.7: Arc Length  
**Chapter 13: Geometry as a Mathematical System**  
13.6: Circle Proofs



| Objectives   | Discovering Geometry Correlation  |
|--|---|
| <p>7. Use a compass and a straightedge for geometric constructions.</p> <ul style="list-style-type: none"> <li>• Parallel lines</li> <li>• Perpendicular lines</li> <li>• Congruent line segments</li> <li>• Median</li> <li>• Altitude</li> <li>• Perpendicular bisector</li> <li>• Congruent angles</li> <li>• Angle bisector</li> </ul> | <p><b>Chapter 3: Using Tools of Geometry</b><br/>All Lessons</p> <p><b>Chapter 4: Discovering and Proving Triangle Properties</b><br/>4.1: Triangle Sum Conjecture<br/>4.2: Properties of Special Triangles<br/>4.5: Are there Congruence Shortcuts?</p> <p><b>Chapter 5: Discovering and Proving Polygon Properties</b><br/>5.3: Kite and Trapezoid Properties<br/>5.4: Properties of Midsegments<br/>5.5: Properties of Parallelograms<br/>5.6: Properties of Special Parallelograms</p> <p><b>Chapter 6: Discovering and Proving Circle Properties</b><br/>6.1: Chord Properties<br/>6.2: Tangent Properties</p> <p><b>Chapter 7: Transformations and Tessellations</b><br/>7.3: Compositions of Transformations</p> |
| <p>8. Demonstrate reflections, translations, and rotations.</p>  | <p><b>Chapter 0: Geometric Art</b><br/>0.1: Geometry in Nature and in Art</p> <p><b>Chapter 7: Transformations and Tessellations</b><br/>All lessons</p>  |
| <p>9. Determine perimeter and area of polygons.</p>  | <p><b>Chapter 8: Area</b><br/>8.1: Areas of Rectangles and Polygons<br/>8.2: Areas of Triangles, Trapezoids, and Kites<br/>8.3: Area Problems<br/>8.4: Areas of Regular Polygons<br/>8.7: Surface Area</p> <p><b>Chapter 12: Trigonometry</b><br/>12.3: The Law of Sines</p>  |
| <p>10. Find the area of an inscribed or a circumscribed polygon or circle.</p>   | <p><b>Chapter 8: Area</b><br/>8.5: Areas of Circles<br/>8.6: Any Way You Slice It</p> <p><b>Chapter 9: The Pythagorean Theorem</b><br/>9.6: Circles and the Pythagorean Theorem</p>   |
| <p>11. Find the surface area and volume of cylinders, spheres, and prisms, given formulas.</p>   | <p><b>Chapter 8: Area</b><br/>8.7: Surface Area</p> <p><b>Chapter 10: Volume</b><br/>10.2: Volume of Prisms and Cylinders<br/>10.4: Volume Problems<br/>10.6: Volume of a sphere<br/>10.7: Surface Area of a Sphere</p>   |



| Content Standards   | Discovering Geometry Correlation   |
|---|--|
| <p>12. Apply postulates and theorems related to parallel lines.</p>   | <p><b>Chapter 2: Reasoning in Geometry</b><br/>2.6: Special angles on Parallel Lines</p> <p><b>Chapter 3: Using Tools of Geometry</b><br/>Using Your Algebra Skills 3: Slopes of Parallel and Perpendicular Lines</p> <p><b>Chapter 5: Discovering and Proving Polygon Properties</b><br/>5.4: Properties of Midsegments<br/>5.5: Properties of Parallelograms</p> <p><b>Chapter 11: Similarity</b><br/>11.6: Proportional Segments Between Parallel Lines</p> <p><b>Chapter 13: Geometry as a Mathematical System</b><br/>13.2: Planning a Geometry Proof<br/>13.4: Quadrilateral Proofs<br/>Using Your Algebra Skills 10: Coordinate Proof</p> |
| <p>13. Apply the definition and theorems related to perpendicular lines.</p>  | <p><b>Chapter 1: Introducing Geometry</b><br/>1.3: What's a Widget</p> <p><b>Chapter 3: Using Tools of Geometry</b><br/>Using Your Algebra Skills 3: Slopes of Parallel and Perpendicular Lines</p> <p><b>Chapter 5: Discovering and Proving Polygon Properties</b><br/>5.6: Properties of Special Parallelograms</p> <p><b>Chapter 13: Geometry as a Mathematical System</b><br/>13.1: The Premises of Geometry<br/>Using Your Algebra Skills 10: Coordinate Proof</p>  |
| <p>14. Describe and use relationships between pairs of angles.</p> <ul style="list-style-type: none"> <li>• Adjacent angles</li> <li>• Vertical angles</li> <li>• Complementary angles</li> <li>• Supplementary angles</li> </ul> | <p><b>Chapter 1: Introducing Geometry</b><br/>1.3: What's a Widget</p> <p><b>Chapter 2: Reasoning in Geometry</b><br/>2.5: Angle Relationships<br/>2.6: Special Angles on Parallel Lines</p> <p><b>Chapter 13: Geometry as a Mathematical System</b><br/>13.2: Planning a Geometry Proof</p>   |
| <p>15. Classify a triangle according to its components.</p>   | <p><b>Chapter 1: Introducing Geometry</b><br/>1.5: Triangles and Special Quadrilaterals</p> <p><b>Chapter 4: Discovering and Proving Triangle Properties</b><br/>4.2: Properties of Special Triangles<br/>4.8: Proving Isosceles Triangle Conjectures</p> <p><b>Chapter 9: The Pythagorean Theorem</b><br/>9.3: Two Special Right Triangles</p> <p><b>Chapter 12: Trigonometry</b><br/>12.1: Trigonometric Ratios<br/>12.2: Problem Solving with Right Triangles</p>   |



| Content Standards   | Discovering Geometry Correlation   |
|---|--|
| <p>16. Apply properties and measures associated with triangles and quadrilaterals to solve problems.</p>  | <p><b>Chapter 4: Discovering and Proving Triangle Properties</b><br/>All lessons</p> <p><b>Chapter 5: Discovering and Proving Polygon Properties</b><br/>5.3: Kite and Trapezoid Properties<br/>5.4: Properties of Midsegments<br/>5.5: Properties of Parallelograms<br/>5.6: Properties of Special Parallelograms</p> <p><b>Chapter 12: Trigonometry</b><br/>All Lessons</p>                                    |
| <p>17. Identify polyhedrons.</p>  | <p><b>Chapter 10: Volume</b><br/>Exploration: The Five Platonic Solids</p>   |
| <p>18. Deduce the measure of angles associated with polygons from given information. (Examples: interior, exterior)</p>   | <p><b>Chapter 5: Discovering and Proving Polygon Properties</b><br/>5.1: Polygon Sum Conjecture<br/>5.2: Exterior Angles of a Polygon<br/>Exploration: Star Polygons</p> <p><b>Chapter 9: The Pythagorean Theorem</b><br/>9.3: Two Special Right Triangles<br/>9.4: Story Problems</p>   |
| <p>19. Determine whether triangles are congruent.</p>   | <p><b>Chapter 4: Discovering and Proving Triangle Properties</b><br/>4.4: Are There Congruence Shortcuts?<br/>4.5: Are There Other Congruence Shortcuts?</p>   |
| <p>20. Describe and identify parts of circles.</p> <ul style="list-style-type: none"> <li>• Radius</li> <li>• Diameter</li> <li>• Tangent</li> <li>• Secant</li> <li>• Chord</li> <li>• Arcs</li> <li>• Central angle</li> <li>• Inscribed angle</li> </ul> | <p><b>Chapter 1: Introducing Geometry</b><br/>1.6: Circles</p> <p><b>Chapter 6: Discovering and Proving Circle Properties</b><br/>All Lessons</p> <p><b>Chapter 8: Area</b><br/>8.5: Areas of Circles<br/>8.6: Any way you Slice It</p>  |
| <p>21. Apply properties and theorems related to circles. (Examples: A diameter perpendicular to a chord bisects the chord and its arcs. The measure of an inscribed angle is equal to one-half the measure of its intercepted arc.)</p>                     | <p><b>Chapter 6: Discovering and Proving Circle Properties</b><br/>6.1: Chord Properties<br/>6.2: Tangent Properties<br/>6.3: Arcs and Angles<br/>6.4: Proving Circle Conjectures</p> <p><b>Chapter 9: The Pythagorean Theorem</b><br/>9.6: Circles and the Pythagorean Theorem</p>  |
| <p>22. Distinguish among circumcenter, incenter, orthocenter, and centroid of a triangle.</p>   | <p><b>Chapter 3: Using Tools of Geometry</b><br/>3.7: Constructing Points of Concurrency<br/>3.8: The Centroid<br/>Exploration: The Euler Line</p> <p><b>Chapter 6: Discovering and Proving Circle Properties</b><br/>Using Your Algebra Skills 6: Finding the Circumcenter</p> <p><b>Chapter 7: Transformations and Tessellations</b><br/>Using Your Algebra Skills 7: Finding the Orthocenter and Centroid</p> |

## Alabama Geometry Standards Patterns, Functions, Algebra

| Content Standards  | <i>Discovering Geometry</i> Correlation   |
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| 23. Find the area of a rectangle or triangle, given the coordinates of the vertices.   | <b>Chapter 8: Area</b><br>Exploration: Geometric Probability II   |
| 24. Determine the slope of a line from its graph or from its equation.   | <b>Chapter 2: Reasoning in Geometry</b><br>Using Your Algebra Skills 2: Slope<br><b>Chapter 4: Discovering and Proving Triangle Properties</b><br>Using Your Algebra Skills 4: Writing Linear Equations   |
| 25. Apply formulas of coordinate geometry. <ul style="list-style-type: none"> <li>• Distance</li> <li>• Slope</li> <li>• Midpoint</li> </ul>   | <b>Chapter 1: Introducing Geometry</b><br>Using Your Algebra Skills 1: Midpoint<br><b>Chapter 2: Reasoning in Geometry</b><br>Using Your Algebra Skills 2: Slope<br><b>Chapter 9: The Pythagorean Theorem</b><br>9.5: Distance In Coordinate Geometry<br><b>Chapter 13: Geometry as a Mathematical System</b><br>Using Your Algebra Skills 10: Coordinate Proof               |
| 26. Determine an equation of a line from given information. <ul style="list-style-type: none"> <li>• Two points</li> <li>• Point and slope</li> <li>• Slope and y-intercept</li> </ul> | <b>Chapter 4: Discovering and Proving Triangle Properties</b><br>Using Your Algebra Skills 4: Writing Linear Equations  |
| 27. Recognize and use the relationship of the slopes of parallel lines and the slopes of perpendicular lines.  | <b>Chapter 3: Using Tools of Geometry</b><br>Using Your Algebra Skills 3: Slopes of Parallel and Perpendicular Lines<br><b>Chapter 5: Discovering and Proving Polygon Properties</b><br>5.4: Properties of Midsegments<br>5.6: Properties of Special Parallelograms<br><b>Chapter 13: Geometry as a Mathematical System</b><br>Using Your Algebra Skills 10: Coordinate Proof |
| 28. Apply the Triangle Inequality Theorem in problem solving.  | <b>Chapter 4: Discovering and Proving Triangle Properties</b><br>4.3: Triangle Inequalities   |
| 29. Recognize and use Pythagorean Triples.   | <b>Chapter 9: The Pythagorean Theorem</b><br>9.2: The Converse of the Pythagorean Theorem<br>9.3: Two Special Right Triangles<br>9.5: Distance in Coordinate Geometry   |
| 30. Apply the Pythagorean Theorem in problem solving using calculators when appropriate.   | <b>Chapter 9: The Pythagorean Theorem</b><br>All lessons<br><b>Chapter 12: Trigonometry</b><br>12.4: The Law of Cosines<br><b>Chapter 13: Geometry as a Mathematical System</b><br>Using Your Algebra Skills 10: Coordinate Proof   |



**Content Standards**

31. Solve an equation involving radicals.
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32. Apply the properties of 30-60-90 degree triangles and 45-45-90 degree triangles.
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33. Solve a problem using ratio or proportion.
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34. Determine the geometric mean between two numbers.
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35. Apply properties of similar polygons in problem solving.
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36. Know the right triangle definitions of the sine, cosine, and tangent functions and use them to solve a triangle.

*Discovering Geometry* Correlation

- Chapter 9: The Pythagorean Theorem**  
 9.5: Distance in Coordinate Geometry
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- Chapter 8: Area**  
 8.4: Areas of Regular Polygons
- Chapter 9: The Pythagorean Theorem**  
 9.3: Two Special Right Triangles  
 9.4: Story Problems
- 
- Chapter 11: Similarity**  
 All lessons
- Chapter 12: Trigonometry**  
 12.1: Trigonometric Ratios  
 12.2: Problem Solving with Right Triangles  
 Exploration: Indirect Measurement  
 12.3: The Law of Sines  
 12.5: Problem Solving with Trigonometry
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- Not covered in *Discovering Geometry***
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- Chapter 11: Similarity**  
 All lessons
- Chapter 12: Trigonometry**  
 12.1: Trigonometric Ratios  
 12.2: Problem Solving with Right Triangles  
 12.3: The Law of Sines  
 12.5: Problem Solving with Trigonometry
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- Chapter 12: Trigonometry**  
 12.1: Trigonometric Ratios  
 12.2: Problem Solving with Right Triangles  
 12.5: Problem Solving with Trigonometry

## Alabama Geometry Standards Probability, Statistics, Discrete Mathematics

| Content Standards   | <i>Discovering Geometry</i> Correlation   |
|---|---|
| 37. Distinguish between inductive and deductive reasoning.  | <b>Chapter 2: Reasoning in Geometry</b><br>2.2: Deductive Reasoning   |
| 38. Recognize the hypothesis and conclusion of an if-then statement.  | <b>Chapter 2: Reasoning in Geometry</b><br>2.2: Deductive Reasoning<br><br><b>Chapter 10: Volume</b><br>Exploration: Sherlock Holmes and Forms of Valid Reasoning   |
| 39. Describe the locus that satisfies a given condition. <ul style="list-style-type: none"> <li>• Circle</li> <li>• Cylinder</li> <li>• Sphere</li> </ul> | <b>Chapter 1: Introducing Geometry</b><br>1.6: Circles<br>1.7: A Picture is Worth a Thousand Words<br><br><b>Chapter 10: Volume</b><br>10.1: The Geometry of Solids |