

## Core Content

<b>Cluster Title: Use coordinates to prove simple geometric theorems algebraically.</b>
<b>Standard:</b> G.GPE.4 Use coordinates to prove simple geometric theorems algebraically. <i>For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; <del>prove or disprove that the point <math>(1, \sqrt{3})</math> lies on the circle centered at the origin and containing the point <math>(0, 2)</math>.</del></i>
<b>Concepts and Skills to Master</b>
<ul style="list-style-type: none"> <li>▪ Use coordinates to prove simple geometric theorems algebraically, focusing on lines, segments, and angles.</li> <li>▪ Prove that points in a plane determine defined geometric figures.</li> </ul>

## Supports for Teachers

<b>Critical Background Knowledge</b>	
<ul style="list-style-type: none"> <li>• Calculate slopes, including slopes of parallel and perpendicular lines.</li> <li>• Understand the relationship between parallel and perpendicular lines.</li> <li>• Calculate distances using the distance formula.</li> <li>• Understand basic properties of geometric figures (e.g. midpoint, segment length, Pythagorean Theorem).</li> <li>• Understand the basic properties of polygons.</li> </ul>	
<b>Academic Vocabulary</b>	
altitude, diagonal, perpendicular, bisector, perpendicular bisector, median, parallel, midpoint, Pythagorean Theorem	
<b>Suggested Instructional Strategies</b>	<b>Resources</b>
<ul style="list-style-type: none"> <li>▪ Explore properties of geometric figures plotted on a coordinate axes system using graphing technology and dynamic software.</li> <li>▪ Generalize coordinates of geometric figures using variables for one or more of the vertices.</li> <li>▪ Derive the equation for a line through two points using similar right triangles.</li> </ul>	Geogebra (freeware) Graphing calculator with dynamic geometry software
<b>Sample Formative Assessment Tasks</b>	
<b>Skill-based Task</b> Prove or disprove that triangle ABC with coordinates A(-1,2), B(1,5), C(-2,7) is an isosceles right triangle.	<b>Problem Task</b> Take a picture or find a picture which includes a polygon. Overlay the picture on a coordinate plane (manually or electronically). Determine the coordinates of the vertices. Classify the polygon. Use the coordinates to justify the classification.

## Core Content

<b>Cluster Title: Use coordinates to prove simple geometric theorems algebraically.</b>
<b>Standard:</b> G.GPE.5 Prove the slope criteria for parallel and perpendicular lines; use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).
<b>Concepts and Skills to Master</b>
<ul style="list-style-type: none"> <li>▪ Prove that the slopes of parallel lines are equal.</li> <li>▪ Prove that the product of the slopes of perpendicular lines is -1.</li> <li>▪ Use slope criteria for parallel and perpendicular lines to solve geometric problems</li> <li>▪ Write the equation of a line parallel or perpendicular to a given line, passing through a given point.</li> </ul>

## Supports for Teachers

<b>Critical Background Knowledge</b>	
Graph parallel and perpendicular lines using transformations. Write the equation of a line through a specific point.	
<b>Academic Vocabulary</b>	
Parallel, perpendicular, reciprocal	
<b>Suggested Instructional Strategies</b>	<b>Resources</b>
<ul style="list-style-type: none"> <li>▪ Allow students to explore and make conjectures about relationships between lines and segments using a variety of methods.</li> <li>▪ Discuss the role of algebra in providing a precise means of representing a visual image.</li> <li>▪ Relate work on parallel lines to systems of equations having no solution or infinitely many solutions.</li> <li>▪</li> </ul>	Dynamic geometry software
<b>Sample Formative Assessment Tasks</b>	
<b>Skill-based Task</b> Find an equation of a line perpendicular to $y = 3x - 4$ that passes through (3,4).	<b>Problem Task</b> Verify that the distance between two parallel lines is constant. Justify your answer.

## Core Content

<b>Cluster Title: Use coordinates to prove simple geometric theorems algebraically.</b>
<b>Standard:</b> G.GPE.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. ★
<b>Concepts and Skills to Master</b>
<ul style="list-style-type: none"> <li>Use the distance formula to compute perimeters of polygons and areas of triangles and rectangles.</li> </ul>

## Supports for Teachers

<b>Critical Background Knowledge</b>	
Find perimeter and area of a variety of shapes, including irregular shapes. Use the distance formula.	
<b>Academic Vocabulary</b>	
Perimeter, polygon, area, distance formula	
<b>Suggested Instructional Strategies</b>	<b>Resources</b>
<ul style="list-style-type: none"> <li>Graph polygons using coordinates. Determine side lengths and perimeters of polygons. Calculate areas of triangles and rectangles.</li> <li>Given a triangle, use slopes to verify that the length and height are perpendicular. Find the area.</li> <li>Explore perimeter and area of a variety of polygons, including convex, concave, and irregularly shaped polygons.</li> </ul>	Google Earth
<b>Sample Formative Assessment Tasks</b>	
<b>Skill-based Task</b> Calculate the area of triangle ABC with altitude $\overline{CD}$ , given A (-4,-2), B (8,7), C (1,8) and D (4,4).	<b>Problem Task</b> Find the area and perimeter of a real world shape using a coordinate grid and Google Earth. Select a shape (your yard, a parking lot, the school, etc.). Use the tool menu to overlay a grid. Use coordinates to find the perimeter and area of the shape you've selected. Determine the scale factor of the picture as related to the actual real life view. Then find the actual perimeter and area.