## Core Content

| **Cluster Title: Use coordinates to prove simple geometric theorems algebraically.** |
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| **Standard G.GPE.4:** Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle;* ~~*prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).*~~ |
| **Concepts and Skills to Master** |
| • Use coordinates to prove simple geometric theorems algebraically, focusing on lines, segments, and angles.<br>• Prove that points in a plane determine defined geometric figures. |

## Supports for Teachers

| **Critical Background Knowledge** | |
|---|---|
| • Calculate slopes, including slopes of parallel and perpendicular lines.<br>• Understand the relationship between parallel and perpendicular lines.<br>• Calculate distances using the distance formula.<br>• Understand basic properties of geometric figures (e.g., midpoint, segment length, Pythagorean Theorem).<br>• Understand the basic properties of polygons. | |
| **Academic Vocabulary** | |
| Altitude, diagonal, perpendicular, bisector, perpendicular bisector, median, parallel, midpoint, Pythagorean Theorem | |
| **Suggested Instructional Strategies** | **Resources** |
| • Explore properties of geometric figures plotted on a coordinate axes system using graphing technology and dynamic software.<br>• Generalize coordinates of geometric figures using variables for one or more of the vertices.<br>• Derive the equation for a line through two points using similar right triangles. | Geogebra (freeware)<br>Graphing calculator with dynamic geometry software |
| **Sample Formative Assessment Tasks** | |
| **Skill-based Task**<br>Prove or disprove that triangle ABC with coordinates A(-1,2), B(1,5), C(-2,7) is an isosceles right triangle. | **Problem Task**<br>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

| **Cluster Title: Use coordinates to prove simple geometric theorems algebraically.** |
|---|
| **Standard 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). |
| **Concepts and Skills to Master** |
| • Prove that the slopes of parallel lines are equal.<br>• Prove that the product of the slopes of perpendicular lines is -1.<br>• Use slope criteria for parallel and perpendicular lines to solve geometric problems.<br>• Write the equation of a line parallel or perpendicular to a given line, passing through a given point. |

## Supports for Teachers

| **Critical Background Knowledge** | |
|---|---|
| • Graph parallel and perpendicular lines using transformations.<br>• Write the equation of a line through a specific point. | |
| **Academic Vocabulary** | |
| Parallel, perpendicular, reciprocal | |
| **Suggested Instructional Strategies** | **Resources** |
| • Allow students to explore and make conjectures about relationships between lines and segments using a variety of methods.<br>• Discuss the role of algebra in providing a precise means of representing a visual image.<br>• Relate work on parallel lines to systems of equations having no solution or infinitely many solutions. | Dynamic geometry software |
| **Sample Formative Assessment Tasks** | |
| **Skill-based Task**<br>Find an equation of a line perpendicular to $y = 3x - 4$ that passes through (3, 4). | **Problem Task**<br>Verify that the distance between two parallel lines is constant. Justify your answer. |

## Core Content

| **Cluster Title: Use coordinates to prove simple geometric theorems algebraically.** |
|---|
| **Standard G.GPE.7:** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.★ |
| **Concepts and Skills to Master** |
| • Use the distance formula to compute perimeters of polygons and areas of triangles and rectangles. |

## Supports for Teachers

| **Critical Background Knowledge** | |
|---|---|
| • Find perimeter and area of a variety of shapes, including irregular shapes. Use the distance formula. | |
| **Academic Vocabulary** | |
| Perimeter, polygon, area, distance formula | |
| **Suggested Instructional Strategies** | **Resources** |
| • Graph polygons using coordinates. Determine side lengths and perimeters of polygons. Calculate areas of triangles and rectangles.<br>• Given a triangle, use slopes to verify that the length and height are perpendicular. Find the area.<br>• Explore perimeter and area of a variety of polygons, including convex, concave, and irregularly shaped polygons. | Google Earth |
| **Sample Formative Assessment Tasks** | |
| **Skill-based Task**<br>Calculate the area of triangle ABC with altitude $\overline{CD}$, given A (-4,-2), B (8,7), C (1,8) and D (4,4). | **Problem Task**<br>Find the area and perimeter of a real-world shape using a coordinate grid and Google Earth.<br>Select a shape (your yard, a parking lot, the school, etc.).<br>Use the tool menu to overlay a grid.Use coordinates to find theperimeter and area of the shape you've selected.<br>Determine the scale factor of the picture as related to the actual real-life view. Then find the actual perimeter and area. |