

Use coordinates to prove simple geometric theorems algebraically (G.GPE.4-5, 7)

**Standard I.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  $(1, \sqrt{3})$  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.

#### Related Standards: Current Course

[I.A.CED.2](#); [I.A.CED.3](#); [I.A.CED.4](#); [I.A.REI.3](#); [I.A.REI.6](#), [I.A.REI.10](#);  
[I.A.REI.11](#); [I.F.IF.1](#); [I.F.IF.4](#); [I.F.IF.5](#); [I.F.IF.7](#); [I.F.IF.9](#); [I.BF.3](#); [All Secondary Math I Geometry Congruence Standards](#)

#### Related Standards: Future Courses

[II.A.SSE.3](#); [II.A.CED.2](#); [II.A.REI.4](#); [II.A.REI.7](#); [II.G.CO.9](#); [II.G.CO.10](#);  
[II.G.CO.11](#); [II.G.SRT.1](#); [II.G.SRT.2](#); [II.G.SRT.4](#); [II.G.SRT.5](#); [II.G.SRT.6](#);  
[II.G.SRT.7](#); [II.G.C.1](#); [II.G.C.2](#); [II.G.C.3](#); [II.G.C.4](#); [II.G.C.5](#); [II.G.GPE.1](#);  
[II.G.GMD.1](#); [III.G.MG.1](#); [III.G.MG.3](#); Pre Calculus G.GPE.2; Pre Calculus G.GPE.3

#### Support for Teachers

##### Critical Background Knowledge

- Compose and understand the coordinate plane ([5.G.1](#))
- Find and position pairs of integers and other rational numbers on a coordinate plane ([6.NS.6c](#))
- Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane ([6.NS.8](#))
- Draw polygons in the coordinate plane given coordinates for the vertices. Apply these techniques in the context of solving real-world and mathematical problems. ([6.G.3](#))
- Use coordinates and absolute value to find distance between points with same x-coordinate or same y-coordinate ([6.NS.8](#))
- Interpret the equation  $y = mx + b$  as defining a linear function, whose graph is a straight line ([8.F.3, 4](#))
- Use similar triangles to explain why the slope  $m$  is the same between any two distinct points on a non-vertical line in the coordinate plane ([8.EE.6](#))
- Apply the Pythagorean Theorem to find the distance between two points. ([8.G.8](#))

##### Academic Vocabulary

Prove, theorem

##### Resources

[Curriculum Resources](http://www.uen.org/core/core.do?courseNum=5600#70394): <http://www.uen.org/core/core.do?courseNum=5600#70394>

Use coordinates to prove simple geometric theorems algebraically (G.GPE.4-5, 7) <b>Standard I.G.GPE.5:</b> 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 <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>	
Related Standards: Current Course <a href="#">I.A.CED.2</a> ; <a href="#">I.A.REI.6</a> ; <a href="#">I.A.REI.10</a> ; <a href="#">I.F.IF.4</a> ; <a href="#">I.F.IF.6</a> ; <a href="#">I.F.IF.7</a> ; <a href="#">I.F.IF.9</a> ; <a href="#">I.F.BF.3</a> ; <a href="#">I.G.CO.1</a> ; <a href="#">I.G.CO.3</a> ; <a href="#">I.G.CO.4</a> ; <a href="#">I.G.CO.5</a> ; <a href="#">I.G.GPE.4</a> ; <a href="#">I.G.GPE.7</a>	Related Standards: Future Courses <a href="#">II.A.SSE.3</a> ; <a href="#">II.A.CED.2</a> ; <a href="#">II.A.CED.3</a> ; <a href="#">II.F.IF.4</a> ; <a href="#">II.F.IF.6</a> ; <a href="#">II.F.IF.7</a> ; <a href="#">II.F.IF.9</a> ; <a href="#">II.F.BF.3</a> ; <a href="#">II.G.CO.9</a> ; <a href="#">II.G.CO.10</a> ; <a href="#">II.G.CO.11</a> ; <a href="#">II.G.SRT.1</a> ; <a href="#">II.G.SRT.2</a> ; <a href="#">II.G.SRT.4</a> ; <a href="#">II.G.SRT.5</a> ; <a href="#">II.G.SRT.6</a> ; <a href="#">II.G.SRT.7</a> ; <a href="#">II.G.C.2</a> ; <a href="#">II.G.C.3</a> ; <a href="#">II.G.C.4</a> ; <a href="#">II.G.GPE.4</a> ; <a href="#">III.G.MG.1</a> ; <a href="#">III.G.MG.3</a>

## Support for Teachers

Critical Background Knowledge <ul style="list-style-type: none"><li>Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane and find distance between points with the same <math>x</math>-coordinate or the same <math>y</math>-coordinate (<a href="#">6.NS.8</a>)</li><li>Interpret the equation <math>y = mx + b</math> as defining a linear function, whose graph is a straight line (<a href="#">8.F.3, 4</a>)</li><li>Use similar triangles to explain why the slope <math>m</math> is the same between any two distinct points (<a href="#">8.EE.6</a>)</li><li>Apply the Pythagorean Theorem to find the distance between two points. (<a href="#">8.G.8</a>)</li><li>Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (<a href="#">I.A.CED.2</a>)</li></ul>
Academic Vocabulary
Parallel, perpendicular, reciprocal
Resources <a href="#">Curriculum Resources</a> : <a href="http://www.uen.org/core/core.do?courseNum=5600#70394">http://www.uen.org/core/core.do?courseNum=5600#70394</a>

Use coordinates to prove simple geometric theorems algebraically (G.GPE.4-5, 7)

**Standard I.G.GPE.7:** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles; e.g., connect with The Pythagorean Theorem and the distance formula. 

Concepts and Skills to Master

- Use the distance formula to compute perimeters of polygons and areas of triangles and rectangles.

Related Standards: Current Course

[I.A.CED.2](#); [I.A.CED.3](#); [I.A.CED.4](#); [I.A.REI.6](#); [I.F.IF.4](#); [I.F.IF.5](#); [I.F.IF.7](#);  
[I.F.BF.3](#); [All Secondary Math I Geometry Congruence Standards](#);  
[I.G.GPE.4](#); [I.G.GPE.5](#)

Related Standards: Future Courses

[II.A.SSE.3](#); [II.A.CED.2](#); [II.A.REI.4](#); [II.A.REI.7](#); [II.G.CO.10](#); [II.G.CO.11](#);  
[II.G.SRT.2](#); [II.G.SRT.4](#); [II.G.SRT.5](#); [II.G.SRT.6](#); [II.G.SRT.8](#); [II.G.C.1](#);  
[II.G.C.3](#); [II.G.GPE.4](#); [II.G.GPE.6](#); [II.G.GMD.3](#); [III.G.MG.1](#); [III.G.MG.2](#);  
[III.G.MG.3](#); Pre Calculus G.GPE.2; Pre Calculus G.GPE.3

Support for Teachers

Critical Background Knowledge

- Solve real-world and mathematical problems involving perimeters of polygons (3.G.8)
- Compose and understand the coordinate plane ([5.G.1](#)) and solve problems by graphing points in all four quadrants of the coordinate plane and use coordinates to find distance between points with same x-coordinate or same y-coordinate ([6.NS.8](#))
- Draw polygons in the coordinate plane given coordinates for the vertices ([6.G.3](#))
- Solve real-world problems involving area ([7.G.6](#))
- Interpret the equation  $y = mx + b$  as defining a linear function, whose graph is a straight line ([8.F.3](#))
- Use similar triangles to explain why the slope  $m$  is the same between any two distinct points ([8.EE.6](#))
- Apply the Pythagorean Theorem to find the distance between two points. ([8.G.8](#))

Academic Vocabulary

Resources

[Curriculum Resources](http://www.uen.org/core/core.do?courseNum=5600#70394): <http://www.uen.org/core/core.do?courseNum=5600#70394>