Translate between the geometric description and the equation for a conic section (Standards G.GPE.1)

**Standard II.G.GPE.1:** Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

**Concepts and Skills to Master**

- Use the Pythagorean Theorem to derive the equation of a circle.
- Find the center and radius of a circle, given its equation.

**Related Standards:**

<table>
<thead>
<tr>
<th>Current Course</th>
<th>Future Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>II.A.SSE.1, II.A.SSE.3.b, II.A.CED.2, II.G.GPE.4, II.G.GPE.6, II.G.GMD.1, II.G.GMD.3, II.G.SRT.1</td>
<td>III.F.TF.2; III.A.CED.2, III.G.GMD.4, III.G.MG.1, III.G.MG.3</td>
</tr>
<tr>
<td>All circle standards in Math II (II.G.C)</td>
<td></td>
</tr>
</tbody>
</table>

**Support for Teachers**

**Critical Background Knowledge**

- Use coordinates and absolute value to find distance between points with the same x-coordinate or the same y-coordinate (6.NS.8)
- Use coordinates to find the length of a side joining points with the same x coordinate or the same y coordinate (6.G.3)
- Know the formulas for the area and circumference of a circle (7.G.4)
- Use the Pythagorean Theorem to find the distance between two points (8.G.8)
- Use coordinates to prove simple geometric theorems algebraically (I.G.GPE.4)
- Complete the square (II.A.SSE.3.b)
- Use the method of completing the square to transform equations into desired forms (I.A.REI.4)

**Academic Vocabulary**

- circle, center of a circle, radius of a circle, completing the square

**Resources**

- Curriculum Resources: [http://www.uen.org/core/core.do?courseNum=5620#71559](http://www.uen.org/core/core.do?courseNum=5620#71559)
Use coordinates to prove simple geometric theorems algebraically. Include simple proofs involving circles (Standards G.GPE.4)

**Standard II.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
- II.A.SSE.3;
- II.A.CED.2;
- II.A.REI.4;
- 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

### Support for Teachers
#### Critical Background Knowledge
- Compose and understand the coordinate plane (5.G.1) and position pairs of integers on a coordinate plane (6.NS.6c)
- Graph points in all four quadrants of the coordinate plane (6.NS.8); draw polygons given coordinates for the vertices (6.G.3)
- Find distance between points with the same \(x\)-coordinate or the same \(y\)-coordinate (6.NS.8)
- 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) and interpret the equation \(y = mx + b\) (8.F.3, 4)
- Apply the Pythagorean Theorem to find the distance between two points (8.G.8)
- Know precise definitions of angles, circles, perpendicular line, parallel line and line segment (I.G.CO.1)
- Create equations in two variables and graph on coordinate axes with labels and scales. (I.A.CED.2)
- Understand the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane (I.A.REI.10)

### Academic Vocabulary
- Prove, theorem

### Resources
- **Curriculum Resources:** [http://www.uen.org/core/core.do?courseNum=5620#71559](http://www.uen.org/core/core.do?courseNum=5620#71559)
Use coordinates to prove simple geometric theorems algebraically. Include simple proofs involving circles (Standards G.GPE.4)

**Standard II.G.GPE.6:** Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

### Concepts and Skills to Master
- Use coordinate geometry to divide a segment into a given ratio.

### Related Standards: Current Course
- II.G.CO.9
- II.G.SRT.1
- II.G.SRT.3
- II.G.SRT.4
- II.G.GPE.4

### Related Standards: Future Courses
- III.G.MG.1
- III.G.MG.3
- Pre Calculus G.GPE 2
- Pre Calculus G.GPE 3

### Support for Teachers

#### Critical Background Knowledge
- Understand ratio concepts and use ratio reasoning to solve problems (6.RP.1)
- Use ratio and rate reasoning to solve real-world problems (6.RP.3)
- 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 (6.NS.8)
- Solve problems involving scale drawings of geometric figures (7.G.1)
- Compute unit rates associated with ratios of lengths (7.RP.1)
- Apply Pythagorean Theorem to find distances (8.G.9)
- Use coordinates to prove simple geometric theorems algebraically (I.G.GPE.4)
- Make a formal construction for bisecting a line segment (I.G.CO.12)

#### Academic Vocabulary
- directed line segment

#### Resources
- **Curriculum Resources:** [http://www.uen.org/core/core.do?courseNum=5620#71559](http://www.uen.org/core/core.do?courseNum=5620#71559)