Mathematics Curriculum

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Topic D:

Equations for Circles and Their Tangents

G-GPE.A.1, G-GPE.A.4

Focus Standard:	G-GPE.A.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.
	G-GPE.A.4	Use coordinates to prove simple geometric theorems algebraically.
Instructional Days:	3	
	Lesson 17:	Writing the Equation for a Circle (P)[1]
	Lesson 18:	Recognizing Equations of Circles (P)
	Lesson 19:	Equations for Tangent Lines to Circles (P)

Topic D consists of three lessons focusing on MP.7. Students see the structure in the different forms of equations of a circle and lines tangent to circles. In Lesson 17, students deduce the equation for a circle in center-radius form using what they know about the Pythagorean theorem and the distance between two points on the coordinate plane (**G-GPE.A.1**). Students first understand that a circle whose center is at the origin of the coordinate plane is given by $x^2 + y^2 = r^2$, where r is the radius. Using their knowledge of translation, students derive the general formula for a circle as $(x - a)^2 + (y - b)^2 = r^2$, where r is the radius of the circle, and (a, b) is the center of the circle. In Lesson 18, students use their algebraic skills of factoring and completing the square to transform equations into center-radius. Students prove that $x^2 + y^2 + Ax + By + C = 0$ is the equation of a circle and find the formula for the center and radius of this circle (**G-GPE.A.4**). Students know how to recognize the equation of a circle once the equation format is in center-radius. In Lesson 19, students again use algebraic skills to write the equations of lines, specifically lines tangent to a circle, using information about slope and/or points on the line. Recalling students' understanding of tangent from Lesson 11 and combining that with the equations of circles from Lessons 17 and 18, students determine the equation of tangent lines to a circle from points outside of the circle.

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[1] Lesson Structure Key: **P**-Problem Set Lesson, **M**-Modeling Cycle Lesson, **E**-Exploration Lesson, **S**-Socratic Lesson