Topic E:

Cyclic Quadrilaterals and Ptolemy's Theorem

G-C.A.3

Focus Standard:	G-C.A.3	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.
Instructional Days:	2	
Lesson 20:	Cyclic Quadrilaterals (P)[1]	
Lesson 21:	Ptolemy's Theorem (E)	

Topic E is a two lesson topic recalling several concepts from the year, e.g., Pythagorean theorem, similarity, and trigonometry, as well as concepts from Module 5 related to arcs and angles. In Lesson 20, students are introduced to the term *cyclic quadrilaterals* and define the term informally as a quadrilateral whose vertices lie on a circle. Students then prove that a quadrilateral is cyclic if and only if the opposite angles of the quadrilateral are supplementary. They use this reasoning and the properties of quadrilaterals inscribed in circles (**G-C.A.3**) to develop the area formula for a cyclic quadrilateral in terms of side length. Lesson 21 continues the study of cyclic quadrilaterals as students prove Ptolemy's theorem and understand that the area of a cyclic quadrilateral is a function of its side lengths and an acute angle formed by its diagonals (**G-SRT.D.9**). Students must identify features within complex diagrams to inform their thinking, highlighting MP.7. For example, students use the structure of an inscribed triangle in a half-plane separated by the diagonal of a cyclic quadrilateral to conclude that a reflection of the triangle along the diagonal produces a different cyclic quadrilateral with an area equal to the original cyclic quadrilateral. Students use this reasoning to make sense of Ptolemy's theorem and its origin.

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