Topic E:

**Cyclic Quadrilaterals and Ptolemy’s Theorem**

G-C.A.3

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| 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]](#footnote-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 [↑](#footnote-ref-1)