Algebra 2: Unit 3 Instructional Focus — Introduction to Trigonometric Functions

Topic	Instructional Foci
Topic 1: Modeling Circular Motion	In Geometry, students defined trigonometric ratios for acute angles using side lengths limited to right triangles. In this topic, students use the sine and cosine functions to model a relationship between two quantities in a real-world context involving circular motion, interpreting key features of graphs and tables in terms of the quantities they represent. They use the sine and cosine ratios and their knowledge of symmetry to describe the vertical and horizontal position of a point following a circular path. They extend the definition of sine and cosine in a way that allows for inputs to be angles of any measure and for outputs to be positive, negative, or zero. *Concepts:* • Use the sine ratio to determine the height of a point following a circular path at a given point on the circle. • Use the sine ratio to model the height of a point following a circular path at a given time. • Extend the definition of sine from a right triangle ratio to a function of an angle of rotation. • Use transformations of the sine function to model circular motion. • Use transformations of the cosine function to model a real-world problem.

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Topic 2: Graphing Trigonometric Functions	Students use their prior understanding from Geometry of radian measure of an angle (i.e., the ratio of the length of the intercepted arc on a circle to the radius of the circle) to extend the domain of sine and cosine to the real numbers. They prove and apply the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$. *Note: this is the limit of instruction about trigonometric identities in Algebra 2.* Students graph trigonometric functions and their transformations, determining period, midline, and amplitude. They use the unit circle to explain key features of the graphs of $y = \sin t$ and $y = \cos t$. Students continue to use the sine and cosine functions to model a relationship between two quantities in a real-world context. They use the unit circle to graph the equation $y = \tan x$ and describe its key features. *Note: Some resources in this topic may ask students to determine the value of sine and cosine for angles associated with special right triangles, however these special ratios are not a focus of Algebra 2 and students should not be expected to memorize them. The reciprocal functions $f(x) = \sec x$, $f(x) = \csc x$, and $f(x) = \cot x$ are not part of instruction in Algebra 2.* ***Concepts:*** • Extend the domain of the sine and cosine functions to all real numbers, interpreted as radian measures of angles. • Graph sine and cosine as functions of real numbers, and identify key features of the graphs. • Graph transformations of the sine and cosine functions, showing period, midline, and amplitude. • Use the sine and cosine functions to model real-world phenomena. • Define and graph the tangent function and identify key features of the graph. • Make connections among a variety of function types, their transformations, and their key features.