

## Unit 6 Trigonometry

### Algebra II

#### Unit Description:

In this unit, students will build on their knowledge of trigonometry from geometry and extend it to radian measure, trigonometric functions, periodic functions, and the unit circle. Students will explore the graphs of sine, cosine, and tangent functions as well as trigonometric identities and reciprocal identities. Students will apply trigonometric functions to understanding real-world periodic phenomena.

#### Standards for Mathematical Practice

- MP.1 Make sense of problems and persevere in solving them.
- MP.2 Reason abstractly and quantitatively.
- MP.3 Construct viable arguments and critique the reasoning of others.
- MP.4 Model with mathematics.
- MP.5 Use appropriate tools strategically.
- MP.6 Attend to precision.
- MP.7 Look for and make use of structure.
- MP.8 Look for and express regularity in repeated reasoning.

#### Louisiana Student Standards for Mathematics (LSSM)

<b>F-TF: Trigonometric Functions</b>	
<b>A. Extend the domain of trigonometric functions using the unit circle.</b>	
F-TF.A.1	Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.
F-TF.A.2	Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
F-TF.A.3 (+)	Use special triangles to determine geometrically the values of sine, cosine, tangent for $\frac{\pi}{3}$ , $\frac{\pi}{4}$ , and $\frac{\pi}{6}$ , and use the unit circle to express the values of sine, cosine, and tangent for $\pi - x$ , $\pi + x$ , and $2\pi - x$ in terms of their values for $x$ , where $x$ is any real number.
<b>B. Model periodic phenomena with trigonometric functions.</b>	
F-TF.B.5	Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. ★
<b>C. Prove and apply trigonometric identities.</b>	

F-TF.C.8	Prove the Pythagorean identity $\sin^2 \theta + \cos^2 \theta = 1$ and use it to find $\sin(\theta)$ , $\cos(\theta)$ , or $\tan(\theta)$ given $\sin(\theta)$ , $\cos(\theta)$ , or $\tan(\theta)$ and the quadrant of the angle.
<b>F-IF: Interpreting Functions</b>	
<b>C. Analyze functions using different representations</b>	
F-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★ <b>e.</b> Graph trigonometric functions, showing period, midline, and amplitude.
<b>F-BF: Building Functions</b>	
<b>B. Build new functions from existing functions</b>	
F-BF.B.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) \pm k$ , $kf(x)$ , $f(kx)$ , and $f(x \pm k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
<b>Additional Standard for Honors Classes</b> <b>(+) F-TF.C.9</b> Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems. (sum and difference formulas)	

**\*As defined by LSSM, the basic modeling cycle involves:**

1. identifying variables in the situation and selecting those that represent essential features,
2. formulating a model by creating and selecting geometric, graphical, tabular, algebraic, or statistical representations that describe relationships between the variables,
3. analyzing and performing operations on these relationships to draw conclusions,
4. interpreting the results of the mathematics in terms of the original situation,
5. validating the conclusions by comparing them with the situation, and then either improving the model or, if it is acceptable,
6. reporting on the conclusions and the reasoning behind them.

*Choices, assumptions, and approximations are present throughout this cycle.*

**Enduring Understandings:**

- A radian measure of an angle is the length of the arc on the unit circle subtended by the angle.
- The unit circle enables the extension of the domain of trigonometric functions to include all real numbers.
- Trigonometric functions can be used to model periodic phenomena.
- The Pythagorean identity  $\sin^2 \theta + \cos^2 \theta = 1$  is very useful when finding  $\sin(\theta)$ ,  $\cos(\theta)$ ,

**Essential Questions:**

- How can you find the measure of an angle in radians?
- What is the unit circle?
- How can you use the unit circle to define the trigonometric functions of an angle?
- What are the characteristics of the real-life problems that can be modeled by trigonometric functions?
- How can you verify a trigonometric identity?

or  $\tan(\theta)$  given  $\sin(\theta)$ ,  $\cos(\theta)$ , or  $\tan(\theta)$   
and the quadrant of the angle.

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