



Math Weekly Lesson Preparation Guide

Teacher Name: Kimberly West	Grade: 11 th /12 th Precalculus
Week of: January 20 th thru 24 th	Unit: 4 Lesson Numbers: 4.3

Purpose: The Weekly Lesson Preparation Guide is to provide a structure that encourages teachers to think through and internalize the daily/weekly instructional expectations.

Planning Questions	Monday NO SCHOOL HOLIDAY	Tuesday Lesson 4.3	Wednesday Lesson 4.3	REVIEW FOR TEST	TEST DAY
1. Which specific Tennessee standard(s) are being addressed in this lesson? What is the focus of this lesson? What will the lesson objective be for each day?		P.G.AT.A.1 Use the definitions of the six trigonometric ratios as ratios of the sides in a right triangle to solve problems about lengths of sides and measures of angles. P.F.TF.A.4 Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions Objective: I can evaluate trig functions of quadrantal angles	P.G.AT.A.1 Use the definitions of the six trigonometric ratios as ratios of the sides in a right triangle to solve problems about lengths of sides and measures of angles. P.F.TF.A.4 Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions Objective: I can evaluate trig functions of quadrantal angles	P.F.TF.A.2 Convert from radians to degrees and from degrees to radians P.F.TF.A.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. P.G.AT.A.1 Use the definitions of the six trigonometric ratios as ratios of the sides in a right triangle to solve problems about lengths of sides and measures of angles. P.F.TF.A.3 Use special triangles to determine	P.F.TF.A.2 Convert from radians to degrees and from degrees to radians P.F.TF.A.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. P.G.AT.A.1 Use the definitions of the six trigonometric ratios as ratios of the sides in a right triangle to solve problems about lengths of sides

Adapted from TDOE Unit and Lesson Preparation Guides

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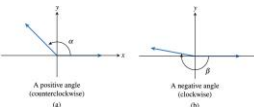
September 2024

		<p>Objective: I can use periodicity to evaluate trig functions</p>	<p>Objective: I can use periodicity to evaluate trig functions</p>	<p>geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$, and $\pi/6$, and explain how to 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</p> <p>P.G.AT.A.1 Use the definitions of the six trigonometric ratios as ratios of the sides in a right triangle to solve problems about lengths of sides and measures of angles.</p> <p>P.F.TF.A.4 Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions</p>	<p>and measures of angles.</p> <p>P.F.TF.A.3 Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$, and $\pi/6$, and explain how to 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</p> <p>P.G.AT.A.1 Use the definitions of the six trigonometric ratios as ratios of the sides in a right triangle to solve problems about lengths of sides and measures of angles.</p> <p>P.F.TF.A.4 Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions</p>
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<p>Modeling:</p> <p>2. Complete all tasks included in the lesson and review the sample/anticipated student responses. For each task consider:</p> <ul style="list-style-type: none"> • What are the multiple solution paths students might take to solve this problem? • What is the purpose of this task? Specifically, which aspect(s) of rigor are being addressed (conceptual understanding, procedural fluency, and/or application)? How does this differ based on the solution path • Given this purpose, what key concepts 		<p>What you'll learn about</p> <ul style="list-style-type: none"> - Trigonometric Functions of Any Angle - Trigonometric Functions of Real Numbers - Periodic Functions - The 16-point unit circle <p>... and why Extending trigonometric functions beyond triangle ratios opens up a new world of applications.</p> <p>Chapter 4 Trigonometric Functions</p> <p>Section 4.3 Trigonometry Extended: The Circular Functions</p> <p>Initial Side, Terminal Side</p>  <p>Positive Angle, Negative Angle</p>  <p>Coterminal Angles</p> <p>Two angles in an extended angle-measurement system can have the same initial side and the same terminal side, yet have different measures. Such angles are called coterminal angles.</p>	<p>Chapter 4 Trigonometric Functions</p> <p>Section 4.3 Trigonometry Extended: The Circular Functions</p> <p>Evaluating Trig Functions of a Nonquadrantal Angle θ (1 of 2)</p> <ol style="list-style-type: none"> 1. Draw the angle θ in standard position, being careful to place the terminal side in the correct quadrant. 2. Without declaring a scale on either axis, label a point P (other than the origin) on the terminal side of θ. 3. Draw a perpendicular segment from P to the x-axis, determining the reference triangle. If this triangle is one of the triangles whose ratios you know, label the sides accordingly. If it is not, then you will need to use your calculator. <p>Evaluating Trig Functions of a Nonquadrantal Angle θ (2 of 2)</p> <ol style="list-style-type: none"> 4. Use the sides of the triangle to determine the coordinates of point P, making them positive or negative according to the signs of x and y in that particular quadrant. 5. Use the coordinates of point P and the definitions to determine the six trig functions. <p>Example: Using One Trig Ratio to Find the Others (1 of 3)</p> <p>Find $\sin \theta$ and $\cot \theta$ by using the given information to construct a reference triangle.</p> <ol style="list-style-type: none"> a. $\cos \theta = -\frac{8}{17}$ and $\csc \theta < 0$ b. $\tan \theta = -\frac{1}{2}$ and $\cos \theta > 0$ 		
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and vocabulary might students need to understand to access the task?

Example 1a: Finding Coterminal Angles

Find a positive angle and a negative angle that are coterminal with 45° .

$$\text{Add } 360^\circ: 45^\circ + 360^\circ = 405^\circ$$

$$\text{Subtract } 360^\circ: 45^\circ - 360^\circ = -315^\circ$$

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Example 1b: Finding Coterminal Angles

Find a positive angle and a negative angle that are coterminal with $\frac{\pi}{6}$.

$$\text{Add } 2\pi: \frac{\pi}{6} + 2\pi = \frac{13\pi}{6}$$

$$\text{Subtract } 2\pi: \frac{\pi}{6} - 2\pi = \frac{11\pi}{6}$$

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Example 2: Evaluating Trig Functions Determined by a Point in Quadrant I

Let θ be the acute angle in standard position whose terminal side contains the point (3,5).

Find the six trigonometric functions of θ .
The distance from (3,5) to the origin is $\sqrt{34}$.

$$\sin \theta = \frac{5}{\sqrt{34}} \approx 0.857 \quad \csc \theta = \frac{\sqrt{34}}{5} \approx 1.166$$

$$\cos \theta = \frac{3}{\sqrt{34}} \approx 0.514 \quad \sec \theta = \frac{\sqrt{34}}{3} \approx 1.944$$

$$\tan \theta = \frac{5}{3} \quad \cot \theta = \frac{3}{5}$$

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Trigonometric Functions of Any Angle

Let θ be any angle in standard position and let $P(x,y)$ be any point on the terminal side of the angle (except the origin). Let r denote the distance from $P(x,y)$ to the origin, i.e., $r = \sqrt{x^2 + y^2}$. Then

$$\sin \theta = \frac{y}{r} \quad \csc \theta = \frac{r}{y} \quad (y \neq 0)$$

$$\cos \theta = \frac{x}{r} \quad \sec \theta = \frac{r}{x} \quad (x \neq 0)$$

$$\tan \theta = \frac{y}{x} \quad (x \neq 0) \quad \cot \theta = \frac{x}{y} \quad (y \neq 0)$$

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Example: Using One Trig Ratio to Find the Others (2 of 3)

a. $\cos \theta = -\frac{8}{17}$ and $\csc \theta < 0$

Since $\cos \theta < 0$ and $\csc \theta = \frac{1}{\sin \theta} < 0$

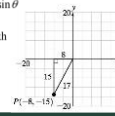
the terminal side is in QIII.

Draw a reference triangle with

$$r = 17, x = -8,$$

$$\text{and } y = \sqrt{17^2 - 8^2} = -15$$

$$\sin \theta = -\frac{15}{17} \quad \text{and } \cot \theta = \frac{8}{15}$$



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Example: Using One Trig Ratio to Find the Others (3 of 3)

b. $\tan \theta = -\frac{1}{2}$ and $\cos \theta > 0$

Since $\tan \theta < 0$ and $\cos \theta > 0$, the terminal side is in QIV.

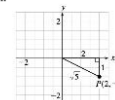
Draw a reference triangle with

$$x = 2, y = -1.$$

$$\text{and } r = \sqrt{2^2 + 1^2} = \sqrt{5}$$

$$\sin \theta = \frac{-1}{\sqrt{5}} \approx -0.447 \quad \text{and}$$

$$\cot \theta = -\frac{2}{1} = -2$$



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Unit Circle

The unit circle is a circle of radius 1 centered at the origin.



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Trigonometric Functions of Real Numbers

Let t be any real number, and let $P(x,y)$ be the point corresponding to t when the number line is wrapped onto the unit circle as described above. Then

$$\sin t = y \quad \csc t = \frac{1}{y} \quad (y \neq 0)$$

$$\cos t = x \quad \sec t = \frac{1}{x} \quad (x \neq 0)$$

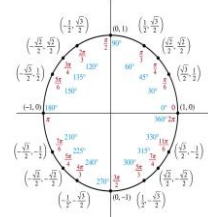
$$\tan t = \frac{y}{x} \quad (x \neq 0) \quad \cot t = \frac{x}{y} \quad (y \neq 0)$$

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Vocabulary

- Initial Side
- Vertex
- Terminal Side
- Measure of an Angle
- Positive Angle
- Negative Angle
- Standard Position
- Coterminal Angles
- Reference Triangle
- Reference Angle
- Quadrantal Angles
- Unit Circle
- Wrapping Function
- Circular Functions
- Periodic
- Period

The 16-Point Unit Circle



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<p>3. What specific tasks/problems will you use to reveal understanding of the grade-level standard(s)? (refer to the Instructional Focus Document Evidence of Learning Statements)</p>		<p>*Selective Practice Problems from pages 340-341 *Look and listen for proper steps and vocabulary used to explain each step in the problem solving process</p>	<p>*Selective Practice Problems from pages 340-341 *Look and listen for proper steps and vocabulary used to explain each step in the problem solving process</p>	<p>*Board-work Problems *Look and listen for proper steps and vocabulary used to explain each step in the problem solving process</p>	
<p>Additional Considerations</p>					
<p>If your lesson contains homework, how will you utilize the work? Will you need to send scaffolding notes home? Is there a strategy you can use to maximize homework?</p>		<p>Homework will be utilized by: Align with Learning Objectives: Ensure that homework directly relates to the concepts taught in class, allowing students to apply their learning. Variety of Tasks: Include different types of problems (e.g., practice, application, extension) to cater to various levels of understanding and to reinforce the concept from multiple angles. Scaffolded Problems: Start with easier problems and gradually increase difficulty. This helps build confidence and understanding before tackling more complex tasks. Extension Challenges: Include a few challenging problems that encourage critical thinking and exploration beyond the basic concepts.</p>	<p>Homework will be utilized by: Align with Learning Objectives: Ensure that homework directly relates to the concepts taught in class, allowing students to apply their learning. Variety of Tasks: Include different types of problems (e.g., practice, application, extension) to cater to various levels of understanding and to reinforce the concept from multiple angles. Scaffolded Problems: Start with easier problems and gradually increase difficulty. This helps build confidence and understanding before tackling more complex tasks. Extension Challenges: Include a few challenging problems that encourage critical thinking and exploration beyond the basic concepts.</p>	<p>Homework will be utilized by: Align with Learning Objectives: Ensure that homework directly relates to the concepts taught in class, allowing students to apply their learning. Variety of Tasks: Include different types of problems (e.g., practice, application, extension) to cater to various levels of understanding and to reinforce the concept from multiple angles. Scaffolded Problems: Start with easier problems and gradually increase difficulty. This helps build confidence and understanding before tackling more complex tasks. Extension Challenges: Include a few challenging problems that encourage critical thinking and exploration beyond the basic concepts.</p>	