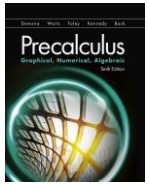
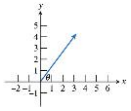
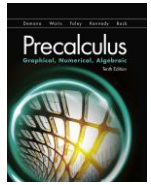
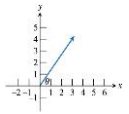
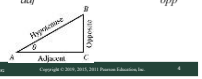
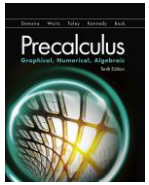
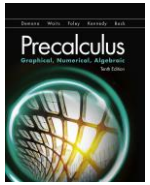
Math Weekly Lesson Preparation Guide

Teacher Name: Kimberly West	**Grade:** 11th /12th Precalculus
Week of: January 13th thru 17th	**Unit:** 4 **Lesson Numbers:** 4.2 AND 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 Lesson 4.2**	**Tuesday Lesson 4.2**	**Wednesday Lesson 4.3**	**Thursday Lesson 4.3**	**Assessment OR Remediation**
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 tringle to solve problems about lengths of sides and measures of angles. **Objective:** I can define the six trigonometric functions **Objective:** I can evaluate trigonometric functions for 30° 45° 60°	**P.G.AT.A.1** Use the definitions of the six trigonometric ratios as ratios of the sides in a right tringle to solve problems about lengths of sides and measures of angles. **Objective:** I can determine the lengths of other sides of a right triangle given one side of an acute angle	**P.G.AT.A.1** Use the definitions of the six trigonometric ratios as ratios of the sides in a right tringle 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 tringle 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 tringle 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 use periodicity to evaluate trig functions	**Objective**: I can use periodicity to evaluate trig functions	
Modeling: 2. **Complete all tasks** included in the lesson and review the sample/anticipated student responses. For each task consider: • 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)?	**Chapter 4** Trigonometric Functions **Section 4.2** Trigonometric Functions of Acute Angles  Standard Position An acute angle θ in **standard position**, with one ray along the positive x-axis and the other extending into the first quadrant.  Trigonometric Functions Let θ be an acute angle in the right $\triangle ABC$. Then $\sin(\theta) = \sin\theta = \frac{opp}{hyp}$ $\quad \operatorname{cosecant}(\theta) = \csc\theta = \frac{hyp}{opp}$ $\cos(\theta) = \cos\theta = \frac{adj}{hyp}$ $\quad \operatorname{secant}(\theta) = \sec\theta = \frac{hyp}{adj}$ $\tan(\theta) = \tan\theta = \frac{opp}{adj}$ $\quad \operatorname{cotangent}(\theta) = \cot\theta = \frac{adj}{opp}$  Example 1: Evaluating Trigonometric Functions of 45° Find the values of all six trigonometric functions for an angle of 45°.  $\sin 45^\circ = \frac{opp}{hyp} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$ $\quad \csc 45^\circ = \frac{hyp}{opp} = \frac{\sqrt{2}}{1}$ $\cos 45^\circ = \frac{adj}{hyp} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$ $\quad \sec 45^\circ = \frac{hyp}{adj} = \frac{\sqrt{2}}{1}$ $\tan 45^\circ = \frac{opp}{adj} = \frac{1}{1} = 1$ $\quad \cot 45^\circ = \frac{adj}{opp} = \frac{1}{1} = 1$	**Chapter 4** Trigonometric Functions **Section 4.2** Trigonometric Functions of Acute Angles  Standard Position An acute angle θ in **standard position**, with one ray along the positive x-axis and the other extending into the first quadrant.  Trigonometric Functions Let θ be an acute angle in the right $\triangle ABC$. Then $\sin(\theta) = \sin\theta = \frac{opp}{hyp}$ $\quad \operatorname{cosecant}(\theta) = \csc\theta = \frac{hyp}{opp}$ $\cos(\theta) = \cos\theta = \frac{adj}{hyp}$ $\quad \operatorname{secant}(\theta) = \sec\theta = \frac{hyp}{adj}$ $\tan(\theta) = \tan\theta = \frac{opp}{adj}$ $\quad \operatorname{cotangent}(\theta) = \cot\theta = \frac{adj}{opp}$ 	**Chapter 4** Trigonometric Functions **Section 4.3** Trigonometry Extended: The Circular Functions  What you'll learn about • Trigonometric Functions of Any Angle • Trigonometric Functions of Real Numbers • Periodic Functions • The 16-point unit circle … and why Extending trigonometric functions beyond triangle ratios opens up a new world of applications. Initial Side, Terminal Side  	**Chapter 4** Trigonometric Functions **Section 4.3** Trigonometry Extended: The Circular Functions  Evaluating Trig Functions of a Nonquadrantal Angle θ (1 of 2) 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. Evaluating Trig Functions of a Nonquadrantal Angle θ (2 of 2) 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.	

- How does this differ based on the solution path
- Given this purpose, what key concepts and vocabulary might students need to understand to access the task?

Example 2: Evaluating Trigonometric Functions of 60°

Find the values of all six trigonometric functions for an angle of 60°.

$\sin 60^\circ = \frac{opp}{hyp} = \frac{\sqrt{3}}{2}$ $\quad \csc 60^\circ = \frac{hyp}{opp} = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

$\cos 60^\circ = \frac{adj}{hyp} = \frac{1}{2}$ $\quad \sec 60^\circ = \frac{hyp}{adj} = \frac{2}{1} = 2$

$\tan 60^\circ = \frac{opp}{adj} = \frac{\sqrt{3}}{1}$ $\quad \cot 60^\circ = \frac{adj}{opp} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

Common Calculator Errors When Evaluating Trig Functions

Using the calculator in the wrong angle mode (degree/radians)

Using the inverse trig keys to evaluate cot, sec, and csc

Using function shorthand that the calculator does not recognize

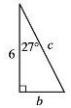
Not closing parentheses

Vocabulary

- Similar
- Right Triangle Trigonometry
- Standard Position
- Solving a Triangle

Example 5: Solving a Right Triangle (1 of 2)

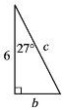
A right triangle with a side length 6 includes a 27° angle adjacent to the side of length 6. Find the measures of the other two angles and the lengths of the other two sides.



Example 5: Solving a Right Triangle (2 of 2)

Since it is a right triangle, one of the other angles is 90°. That leaves $180° - 90° - 27° = 63°$ for the third angle.

Use the labels on the figure to set up equations to find a and b.



$\cos 27^\circ = \frac{6}{c}$ $\quad \tan 27^\circ = \frac{b}{6}$

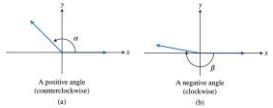
$c = \frac{6}{\cos 27^\circ}$ $\quad b = 6\tan 27^\circ$

$c \approx 6.73$ $\quad b \approx 3.06$

Vocabulary

- Similar
- Right Triangle Trigonometry
- Standard Position
- Solving a Triangle

Positive Angle, Negative Angle



Coterminal Angles

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**.

Example 1a: Finding Coterminal Angles

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

Add 360°: $45° + 360° = 405°$

Subtract 360°: $45° - 360° = -315°$

Example 1b: Finding Coterminal Angles

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

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

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

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 $\sqrt{34}$.

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

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

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

Example: Using One Trig Ratio to Find the Others (1 of 3)

Find $\sin\theta$ and $\cot\theta$ by using the given information to construct a reference triangle.

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

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

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

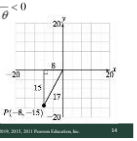
a. $\cos\theta = -\frac{8}{17}$ and $\csc\theta < 0$

Since $\cos\theta < 0$ and $\csc\theta = \frac{1}{\sin\theta} < 0$ the terminal side is in QIII.

Draw a reference triangle with $r = 17$, $x = -8$.

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

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



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

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

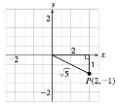
Since $\tan\theta < 0$ and $\cos\theta > 0$, the terminal side is in QIV.

Draw a reference triangle with $x = 2$, $y = -1$.

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

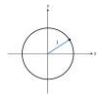
$\sin\theta = \frac{-1}{\sqrt{5}} \approx -0.447$ and

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



Unit Circle

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



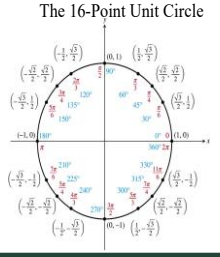
Trigonometric Functions of Real Numbers

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

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

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

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

			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., let $r = \sqrt{x^2 + y^2}$. Then $\sin\theta = \frac{y}{r}$ $\quad \csc\theta = \frac{r}{y}$ $\quad (y \neq 0)$ $\cos\theta = \frac{x}{r}$ $\quad \sec\theta = \frac{r}{x}$ $\quad (x \neq 0)$ $\tan\theta = \frac{y}{x}$ $(x \neq 0)$ $\quad \cot\theta = \frac{x}{y}$ $\quad (y \neq 0)$ Pearson ALWAYS LEARNING Copyright © 2019, 2015, 2011 Pearson Education, Inc. 9	**Periodic Function** A function $y = f(t)$ is **periodic** if there is a positive number c such that $f(t + c) = f(t)$ for all values of t in the domain of f. The smallest such number c is called the **period** of the function. Pearson ALWAYS LEARNING Copyright © 2019, 2015, 2011 Pearson Education, Inc. 18 **The 16-Point Unit Circle**  Pearson ALWAYS LEARNING Copyright © 2019, 2015, 2011 Pearson Education, Inc. 19	

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)	*Selective Practice Problems from pages *Look and listen for proper steps and vocabulary used to explain each step in the problem solving process	*Selective Practice Problems from pages *Look and listen for proper steps and vocabulary used to explain each step in the problem solving process	*Selective Practice Problems from pages *Look and listen for proper steps and vocabulary used to explain each step in the problem solving process	*Selective Practice Problems from pages *Look and listen for proper steps and vocabulary used to explain each step in the problem solving process	
Additional Considerations					
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?	**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	**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.	**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	**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.	

	that encourage critical thinking and exploration beyond the basic concepts.	Extension Challenges: Include a few challenging problems that encourage critical thinking and exploration beyond the basic concepts.	problems that encourage critical thinking and exploration beyond the basic concepts.	Extension Challenges: Include a few challenging problems that encourage critical thinking and exploration beyond the basic concepts.	