Math Weekly Lesson Preparation Guide

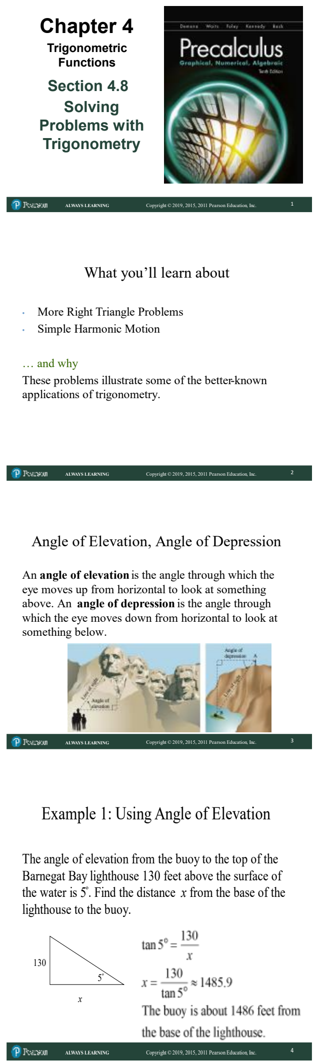
Teacher Name: Kimberly West	**Grade:** 11th /12th Precalculus
Week of: February 24th thru 28th	**Unit:** 5 **Lesson Numbers:** 4.8 Solving Problems with Trigonometry 5.1Fundamental Identities 5.2 Proving Trigonometric Identities

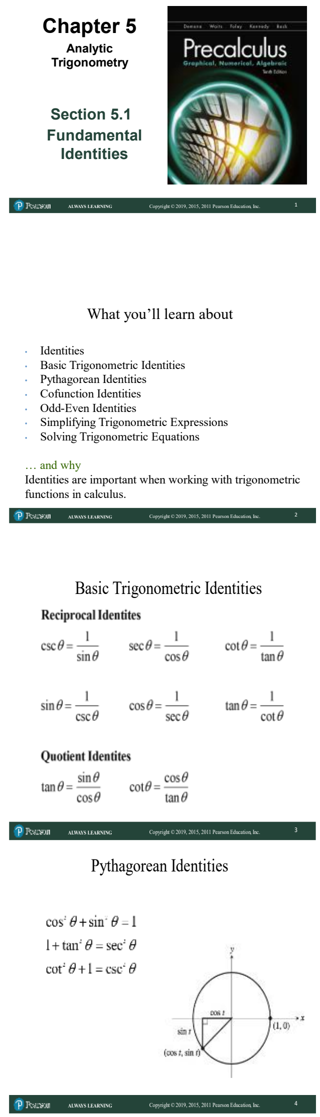
Purpose: The Weekly Lesson Preparation Guide is to provide a structure that encourages teachers to think through and internalize the daily/weekly instructional expectations.

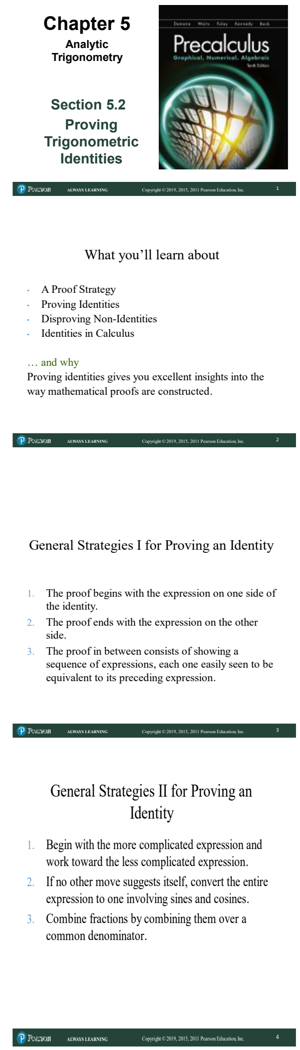
Planning Questions	**Monday Lesson 4.8**	**Tuesday Lesson 5.1**	**Wednesday Lesson 5.2**	**Thursday Lesson 5.2**	**Assessment OR Remediation**
1. Which specific Tennessee **standard(s)** are being addressed in this lesson? What is the focus of this lesson? What will the lesson **objective** be for each day?	**P.G.AT.A.1** Use the definitions of the six trigonometric ratios as ratios of sides in a right triangle to solve problems about lengths of sides and measures of angles. **Objective**: I can determine the angle of elevation/depression and distance using right triangles.	**P.G.TI.A.1** Apply trigonometric identities to verify identities and solve equations. Identities include : Pythagorean, reciprocal, quotient, sum/difference, double-angle, and half-angle. **Objective**: I can simplify trigonometric expressions using basic trigonometric identities.	**P.G.TI.A.1** Apply trigonometric identities to verify identities and solve equations. Identities include: Pythagorean, reciprocal, quotient, sum/difference, double-angle, and half-angle. **Objective**: I can prove an algebraic or trigonometric identity.	**P.G.TI.A.1** Apply trigonometric identities to verify identities and solve equations. Identities include : Pythagorean, reciprocal, quotient, sum/difference, double-angle, and half-angle. **Objective**: I can prove an algebraic or trigonometric identity.	**P.G.AT.A.1** Use the definitions of the six trigonometric ratios as ratios of sides in a right triangle to solve problems about lengths of sides and measures of angles. **P.G.TI.A.1** Apply trigonometric identities to verify identities and solve equations. Identities include: Pythagorean, reciprocal, quotient, sum/difference, double-angle, and half-angle.

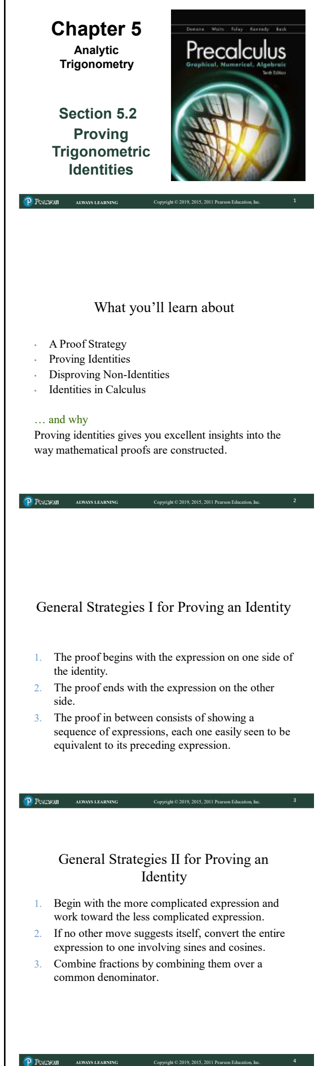
Modeling:

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)? How does this differ based on the solution path
   - Given this purpose, what key concepts and vocabulary might students

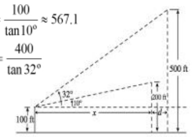
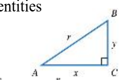








Vocabulary
- Angle of Elevation
- Angle of Depression
- Solve Algebraically
- Knots
- Simple Harmonic Motion
- Frequency
- Identities
- Domain of Validity
- Reduction Formula

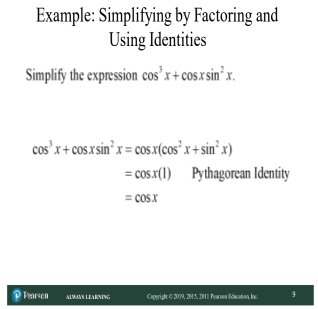
need to understand to access the task?	**Example 2: Making Indirect Measurements (1 of 2)** From the top of a 100 ft. tall air traffic control tower, an airplane is observed flying toward the tower. If the angle of elevation of the airplane changes from 32º to 10º during the period of observation, and the altitude of the airplane changes from 500 ft to 200 ft, how far does the plane travel? Pearson ALWAYS LEARNING Copyright © 2019, 2015, 2011 Pearson Education, Inc. 5 **Example 2: Making Indirect Measurements (2 of 2)** The figure models the situation. Let x = distance from the tower at the second observation. Let d = distance plan moves $\tan 10^\circ = \frac{100}{x}$ $x = \frac{100}{\tan 10^\circ} \approx 567.1$ $\tan 32^\circ = \frac{400}{x+d}$ $x + d = \frac{400}{\tan 32^\circ}$ $d = \frac{400}{\tan 32^\circ} - \frac{100}{\tan 10^\circ}$ $d \approx 73.0$  Pearson ALWAYS LEARNING Copyright © 2019, 2015, 2011 Pearson Education, Inc. 6	**Example 1: Using Identities** Find $\sin\theta$ and $\cos\theta$ if $\tan\theta = 3$ and $\cos\theta < 0$. $1 + \tan^2\theta = \sec^2\theta$ $1 + 9 = \sec^2\theta$ $\sec\theta = \pm\sqrt{10}$ $\cos\theta = -1/\sqrt{10}$ To find $\sin\theta$, use $\tan\theta = 3$ and $\cos\theta = -1/\sqrt{10}$. $\tan\theta = \frac{\sin\theta}{\cos\theta}$ $\sin\theta = \cos\theta\tan\theta$ $\sin\theta = \left(-1/\sqrt{10}\right)(3)$ $\sin\theta = -3/\sqrt{10}$ Therefore, $\cos\theta = -1/\sqrt{10}$ and $\sin\theta = -3/\sqrt{10}$ Pearson ALWAYS LEARNING Copyright © 2019, 2015, 2011 Pearson Education, Inc. 5 **Cofunction Identities**  Angle A: $\sin A = \frac{y}{r}$ $\tan A = \frac{y}{x}$ $\sec A = \frac{r}{x}$ $\cos A = \frac{x}{r}$ $\cot A = \frac{x}{y}$ $\csc A = \frac{r}{y}$ Angle B: $\sin B = \frac{x}{r}$ $\tan B = \frac{x}{y}$ $\sec B = \frac{r}{y}$ $\cos B = \frac{y}{r}$ $\cot B = \frac{y}{x}$ $\csc B = \frac{r}{x}$ Pearson ALWAYS LEARNING Copyright © 2019, 2015, 2011 Pearson Education, Inc. 6 **Cofunction Identities** $\sin\left(\frac{\pi}{2} - \theta\right) = \cos\theta$ $\cos\left(\frac{\pi}{2} - \theta\right) = \sin\theta$ $\tan\left(\frac{\pi}{2} - \theta\right) = \cot\theta$ $\cot\left(\frac{\pi}{2} - \theta\right) = \tan\theta$ $\sec\left(\frac{\pi}{2} - \theta\right) = \csc\theta$ $\csc\left(\frac{\pi}{2} - \theta\right) = \sec\theta$ Pearson ALWAYS LEARNING Copyright © 2019, 2015, 2011 Pearson Education, Inc. 7 **Even-Odd Identities** $\sin(-x) = -\sin x$ $\cos(-x) = \cos x$ $\tan(-x) = -\tan x$ $\csc(-x) = -\csc x$ $\sec(-x) = \sec x$ $\cot(-x) = -\cot x$ Pearson ALWAYS LEARNING Copyright © 2019, 2015, 2011 Pearson Education, Inc. 8	**General Strategies III for Proving an Identity** 1. Use the algebraic identity $(a + b)(a - b) = a^2 - b^2$ to set up applications of the Pythagorean identities. 2. Always be mindful of the "target" expression, and favor manipulations that bring you closer to your goal. Pearson ALWAYS LEARNING Copyright © 2019, 2015, 2011 Pearson Education, Inc. 6 **Example: Setting up a Difference of Squares** Prove the identity: $\frac{\sin x}{1-\cos x} = \frac{1+\cos x}{\sin x}$. $\frac{\sin x}{1-\cos x} = \frac{\sin x}{1-\cos x}\cdot\frac{1+\cos x}{1+\cos x}$ $= \frac{(\sin x)(1+\cos x)}{1-\cos^2 x}$ $= \frac{(\sin x)(1+\cos x)}{\sin^2 x}$ $= \frac{1+\cos x}{\sin x}$ Pearson ALWAYS LEARNING Copyright © 2019, 2015, 2011 Pearson Education, Inc. 5	**General Strategies III for Proving an Identity** 1. Use the algebraic identity $(a + b)(a - b) = a^2 - b^2$ to set up applications of the Pythagorean identities. 2. Always be mindful of the "target" expression, and favor manipulations that bring you closer to your goal. Pearson ALWAYS LEARNING Copyright © 2019, 2015, 2011 Pearson Education, Inc. 6 **Identities in Calculus** 1. $\cos^3 x = (1 - \sin^2 x)(\cos x)$ 2. $\sec^4 x = (1 + \tan^2 x)(\sec^2 x)$ 3. $\sin^2 x = \frac{1}{2} - \frac{1}{2}\cos 2x$ 4. $\cos^2 x = \frac{1}{2} + \frac{1}{2}\cos 2x$ 5. $\sin^5 x = (1 - 2\cos^2 x + \cos^4 x)(\sin x)$ 6. $\sin^2 x\cos^5 x = (\sin^2 - 2\sin^4 x + \sin^6 x)(\cos x)$ Pearson ALWAYS LEARNING Copyright © 2019, 2015, 2011 Pearson Education, Inc. 7 **Example: Proving an Identity Useful in Calculus** Prove the following identity: $\sin^5 x\cos^2 x = (\sin x)(\cos^2 - 2\cos^4 x + \cos^6 x)$ $= (\sin x)(\sin^2 x)^2(\cos^2 x)$ $= (\sin x)(1 - \cos^2 x)^2(\cos^2 x)$ $= (\sin x)(1 - 2\cos^2 x + \cos^4 x)(\cos^2 x)$ $= (\sin x)(\cos^2 - 2\cos^4 x + \cos^6 x)$ Pearson ALWAYS LEARNING Copyright © 2019, 2015, 2011 Pearson Education, Inc. 8	

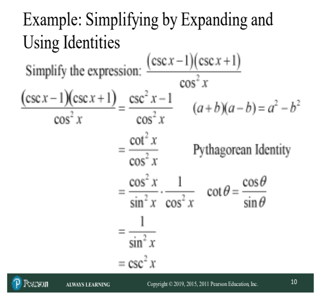
<table>
<tr>
<td></td>
<td>

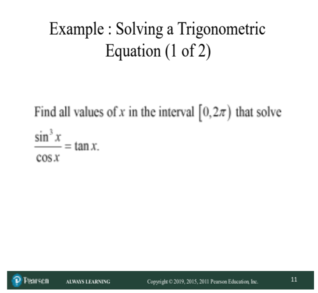
Vocabulary

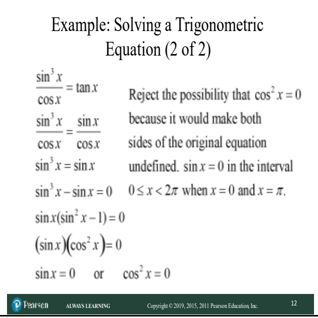
- Angle of Elevation
- Angle of Depression
- Solve Algebraically
- Knots
- Simple Harmonic Motion
- Frequency

</td>
<td>









</td>
<td>

Vocabulary

- Reduction Formula

</td>
<td>

Vocabulary

- Reduction Formula

</td>
<td></td>
</tr>
</table>

		Vocabulary • Identities • Domain of Validity			
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 **403-404** *Look and listen for proper steps and vocabulary used to explain each step in the problem solving process	*Selective Practice Problems from pages **403-404** *Look and listen for proper steps and vocabulary used to explain each step in the problem solving process	*Selective Practice Problems from pages **411-412** *Look and listen for proper steps and vocabulary used to explain each step in the problem solving process	*Selective Practice Problems from pages **411-412** *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	**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	**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	

		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.	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.	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.	