Guided Notes #4-3 (Section 4.2: trigonometric functions of acute angles, day 1)

Warm-Up

Find the missing sides of the right triangle (see figure 4.8; pg. 329)
1. \[ \sqrt{197} \text{ m} \]
2. \[ 5 \text{ ft} \]
3. \[ \sqrt{37} \text{ ft} \]

4. \[ \frac{1}{\sqrt{3}} \]
5. \[ \sqrt{\frac{2}{5}} \]
6. \[ \frac{2}{\sqrt{8}} \]

Today, we are going to focus on right triangle trigonometry.
Begin reading on pg. 329, under “Right Triangle Trigonometry”

**Paragraph 1**
What are similar figures?

**Paragraph 2**
Thus, a single __________ angle ______ of a __________ triangle determines _____ distinct __________ of side lengths.

**Paragraph 3**
What is standard position

Draw figure 4.7 below
**DEFINITION**  **Trigonometric Functions**  
Let \( \theta \) be an acute angle in right \( \triangle ABC \) (figure 4.8). Then:

Draw figure 4.8 below

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**Example 1:** Finding all 6 trigonometric functions

a. 

\[
\begin{array}{c}
13 \text{ m} \\
5 \text{ m} \\
12 \text{ m}
\end{array}
\]

b. 

\[
\begin{array}{c}
5 \\
\sqrt{130} \\
11
\end{array}
\]

Assume that \( \theta \) is an acute angle in a right triangle satisfying the given conditions. Evaluate the remaining trigonometric functions.

c.  \( \sin \theta = \frac{3}{7} \)

\[ \sin \theta = \frac{3}{7} \]

*start with a sketch of a right triangle*

d.  \( \csc \theta = \frac{12}{5} \)

\[ \csc \theta = \frac{12}{5} \]

*start with a sketch of a right triangle*
Go to page 330 and begin reading under “Two Famous Triangles”

Every student of trigonometry (precalculus) should be able to find these special values
____________________ a calculator! MEMORIZE!

Not in book!!!!

Finding the side lengths of the special right triangles

<table>
<thead>
<tr>
<th>This is an isosceles right triangle</th>
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<tbody>
<tr>
<td>What do you know about the two sides of the isosceles triangle?</td>
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<tr>
<td>________________________________</td>
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</tbody>
</table>

| What do you know about the two base angles of an isosceles triangle? |
| ________________________________ |

| What is the measurement of the base angles? |
| _____ ° or _____ (radians) |

Let \( c = 1 \). Solve for the remaining sides (Pythagorean Theorem)
*follow those pesky radical rules!*

Label the triangle with number values!

simplify the radicals!

Use your labeled triangle (with numbers) to find the 6 trigonometric functions for \( 45°/\frac{\pi}{4} \)

Check your answers: Pg. 330, ex. 1
The other special triangle is based off of an equilateral triangle.

What do you know about the sides of an equilateral triangle?
____________________________________________________

What do you know about the angles of an equilateral triangle?
____________________________________________________

What is the measurement of the angles? __________° or _______ (radians)

At the vertex (top), drop a perpendicular bisector to the base. This creates 2 right triangles inside the equilateral triangle.

When we bisect an angle, we cut the angle in ________!
When we bisect a side, we cut the side in _________!

Use the Pythagorean theorem to find the missing side (height) of the right triangle.

Use your labeled triangle (with numbers) to find the 6 trigonometric functions for 30° and for 60°

<table>
<thead>
<tr>
<th>Labeled Triangle:</th>
<th>30° and $\frac{\pi}{6}$</th>
<th>60° and $\frac{\pi}{3}$</th>
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simplify the radicals!

Example 2: Using our chart to evaluate trig expressions

a. $\csc \frac{\pi}{3}$

b. $\cot \frac{\pi}{4}$

c. $\tan \frac{\pi}{6}$

d. $\sin \frac{\pi}{4}$

e. $\sec \frac{\pi}{3}$

f. $\cos \frac{\pi}{6}$

Ex. 2: (a) $\frac{2\sqrt{3}}{2}$ (b) 1 (c) $\frac{\sqrt{3}}{3}$ (d) $\frac{\sqrt{3}}{2}$ (e) 2 (f) $\frac{\sqrt{3}}{2}$

Draw one of the two new right triangles below

Label the angles (°) on the picture

Label the angles with number values

Label the side lengths with number values

Redraw the right triangle, labeling the sides and angles.

Check your answers: Pg. 331, ex. 2
Summary:

<table>
<thead>
<tr>
<th></th>
<th>$30^\circ$ or $\frac{\pi}{6}$</th>
<th>$60^\circ$ or $\frac{\pi}{3}$</th>
<th>$45^\circ$ or $\frac{\pi}{4}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\sin \theta =$</td>
<td>$\csc \theta =$</td>
<td>$\sin \theta =$</td>
<td>$\csc \theta =$</td>
</tr>
<tr>
<td>$\cos \theta =$</td>
<td>$\sec \theta =$</td>
<td>$\cos \theta =$</td>
<td>$\sec \theta =$</td>
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<td>$\tan \theta =$</td>
<td>$\cot \theta =$</td>
<td>$\tan \theta =$</td>
<td>$\cot \theta =$</td>
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