Secondary 2
lesson 11.3

Right Triangle Trigonometry: Sin, Cos, and Tan

Objectives:

Understand trig ratios

Understand SohCahToa

Understand and use complimentary angles

Ratio Review

- What is a ratio?
  - A ratio is a **comparison** between 2 values and is usually represented as a fraction.

- Examples
  - $\frac{3}{4}$
  - $\frac{10}{7}$
  - $\frac{15}{17}$

Trigonometric Ratios

- Trigonometry is a part of mathematics in which we use a ratio of two sides of a **right triangle** to solve for missing sides or angles.

- The **KEY** to solving ***any*** trigonometry problem is to identify which angle is being used.
  - **HINT:** Never ever ever use the $90°$ angle

Trigonometric Ratios

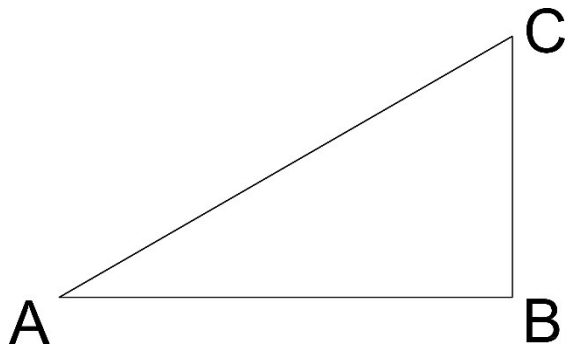
- Once the angle has been identified, label the three sides as:
  - Opposite – Side **ACROSS** from the angle
  - Adjacent – Side **NEXT TO** the angle
  - Hypotenuse – Side **ACROSS** from the right angle

- It is helpful to know that the hypotenuse will always be in the same location. However, the opposite and adjacent sides can switch locations depending on the angle location.

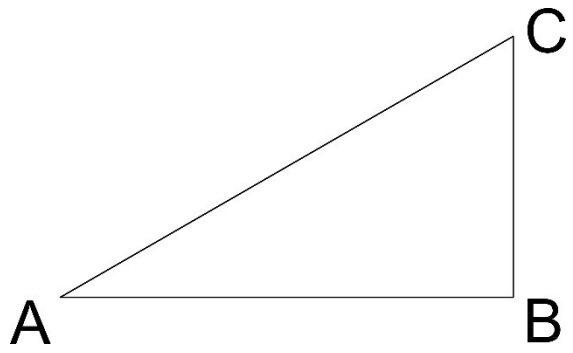
Example

- In the right triangles below identify the opposite, adjacent, and hypotenuse for the angle listed

$\angle A$



$\angle C$



- What did you notice about the location of the sides in each triangle?

Sin, Cos, & Tan

- There are 3 basic trigonometric ratios:
  - Sine (sin), Cosine (cos), Tangent (tan)

- These ratios are formed by using 2 of the three sides labeled on the triangle
  - sin = $\frac{opposite}{hypotenuse}$ or $\frac{opp}{hyp}$
  - cos = $\frac{adjacent}{hypotenuse}$ or $\frac{adj}{hyp}$
  - tan = $\frac{opposite}{adjacent}$ or $\frac{opp}{adj}$

SOH CAH TOA

- An easy way to remember how to set up each trigonometric ratio is to remember

S
O
H
C
A
H
T
O
A

Writing Trigonometric Equations

- When writing a trigonometric equation, use the following format:

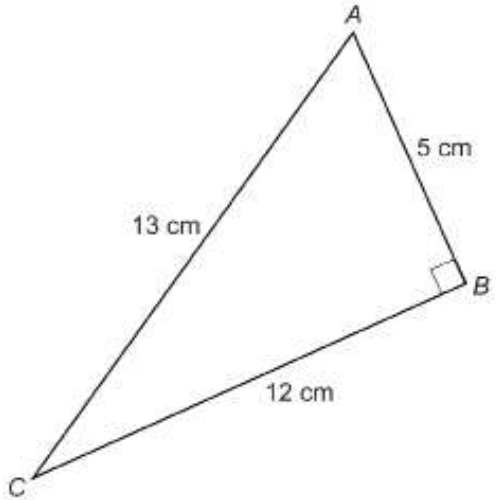
$$\sin \_\_\_ = \frac{opp}{hyp}$$

  - The same would apply to cos and tan

- Example: $\tan A = \frac{5}{7}, \cos 41° = \frac{3}{4}$

Example

- Find the sin, cos, & tan ratios for $\angle A$ in the triangle below:



Find the sin, cos, & tan ratios for ∠C in the triangle above:

Compare your answers with the answers of the last example. What do you notice?

Sin & Cos of Complementary Angles

- Recall that complementary angles are two angles that add to $90°$
- The sine value of an angle will always be equal to the cosine value of the complement of that angle
  - $\sin 30° = \cos 60°$
- Example: If $\sin 32° = 0.5299$, what is $\cos 58°$?

- Example: If $\cos 78° = 0.2079$, what is $\sin 12°$?

Example

- Solve for x

$$\sin 43° = \cos x$$

- Solve for x

$$\cos 51.5° = \sin x$$

Finding Missing Sides

- To find a missing side in a right triangle when you only have one side and one angle, the Pythagorean Theorem does not work. Instead, you will have to use trigonometry. Follow the steps on the next slide and be sure your calculator is set up in **degree** mode

- On a TI-83 or TI-84 Calculator, check the mode by hitting the mode button. If degree is not highlighted, arrow over to Degree and hit enter. Then hit **2^{nd} Mode** to get back to the main screen.

Steps for Finding a Missing Side

1. Set up a sin, cos, or tan equation
   a. Identify the angle being used (this will be a number value)
   b. Identify the two sides being used (one side will be a number and the other side will be a variable)

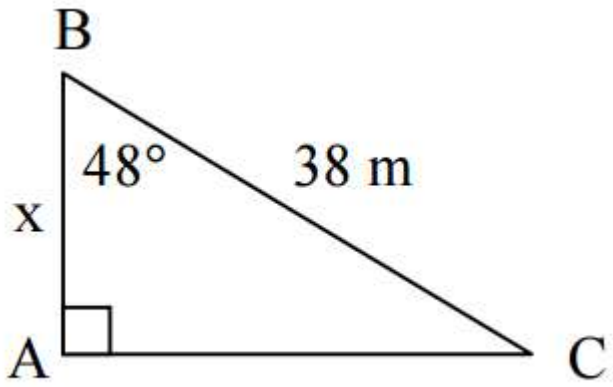
2. Determine whether the top or bottom number is missing:
   a. If the top number is missing, solve the equation by multiplying both sides by the bottom number

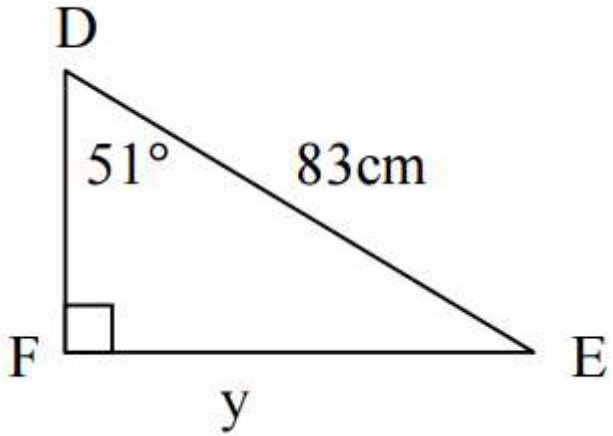
$$\tan 13 = \frac{x}{4} \rightarrow 4 \cdot \tan 13 = \frac{x}{4} \cdot 4 \rightarrow 4 \tan 13 = x$$

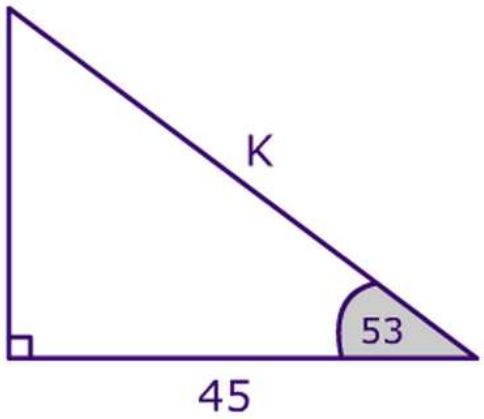
   a. If the bottom number is missing, solve the equation by dividing the top number by the trig part

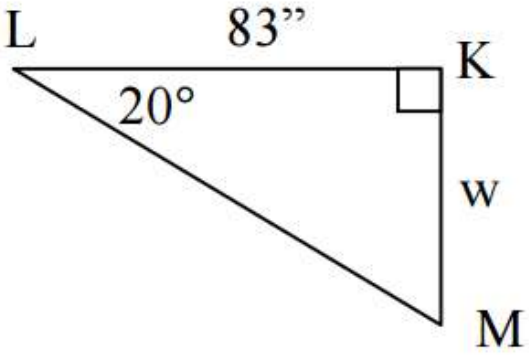
$$\sin 42 = \frac{11}{x} \rightarrow x = \frac{11}{\sin 42}$$

Solve for the missing side using sin, cos. or tan

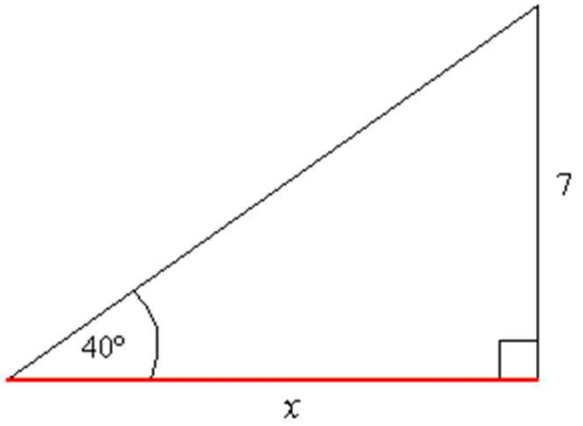


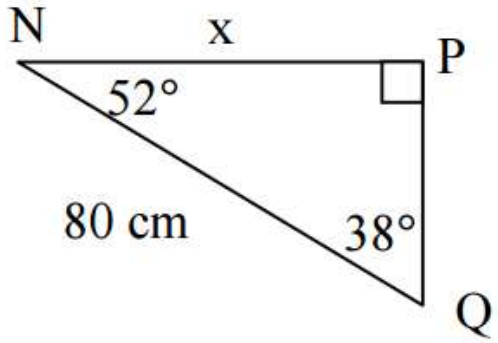


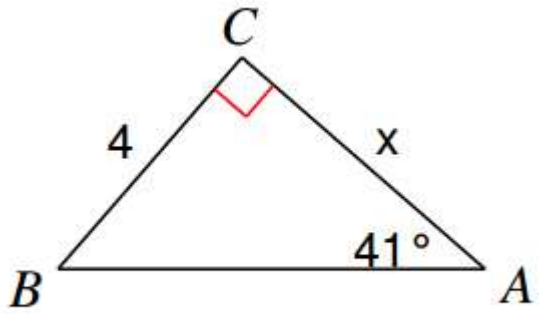


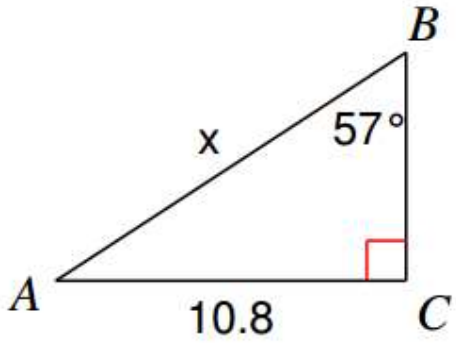


Solve for the missing side using sin, cos, or tan









Assignment:

Worksheet 11.3 and XL11.3