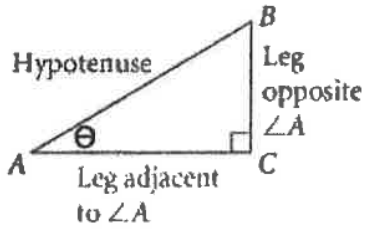
Lesson 3.2 - SOH CAH TOA

Lesson 3.3 - Right Triangle Trigonometry (part 1)

Learning Objectives: SWBAT

1. Use Trigonometric Ratios to solve for the missing sides of a right triangle

You may remember from Geometry the diagram below of a basic right triangle:



- The Hypotenuse is always opposite the right angle
- The legs are classified as "opposite" and/or "adjacent" to the acute angle that is being measured. This angle is called the **ANGLE OF REFERENCE** and is often noted by using the greek letter "theta" e

What is SOH CAH TOA?

- SOH CAH TOA is a way to remember the THREE ratios of any right triangle. There are three ratios because there are three possible combinations of ratios that can be from the sides
- Below is are examples of the SINE, COSINE and TANGENT ratios for the given right triangle ABC above (using ∠ A as the angle of reference)

(A) The sine of an acute angle is the ratio of the length of the leg opposite the acute angle to the length hypotenuse.

$$\text{Sin } A = \frac{\text{opposite}}{\text{Hypotenuse}} = \frac{BC}{AB}$$ **SOH**

(B) The cosine of an acute angle is the ratio of the length of the leg adjacent to the acute angle to the length hypotenuse.

$$\text{Cos } A = \frac{\text{adjacent}}{\text{Hypotenuse}} = \frac{AC}{AB}$$ **CAH**

(C) The tangent of an acute angle is the ratio of the length of the leg opposite the acute angles to the length of the leg adjacent the acute angle.

$$\text{Tan } A = \frac{\text{opposite}}{\text{Adjacent}} = \frac{BC}{AC}$$ **TOA**

Your Turn: Write each of the above ratios again, but this time use angle B as the "angle of reference

$$\text{Sin B} = \frac{\text{opposite}}{\text{Hypotenuse}} = \frac{AC}{AB} \qquad \text{Tan B} = \frac{\text{opposite}}{\text{Adjacent}} = \frac{AC}{BC}$$

$$\text{Cos B} = \frac{\text{adjacent}}{\text{Hypotenuse}} = \frac{BC}{AB}$$

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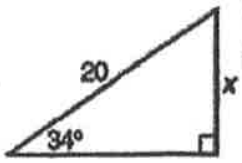
Using SOH CAH TOA to determine missing side lengths of a right triangle

- **Examples**

(5) Use each of the diagrams to solve for x: (Round 2 decimal places)

(a)



When x is on top

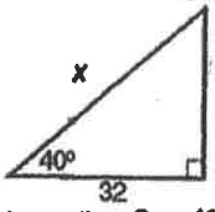
Step 1: Plug info into equation: $\sin 34^\circ = \frac{x}{20}$

Step 2: Determine Trig Ratio $0.559 = \frac{x}{20}$

Step 3: Cross Multiply: $0.559 * 20 = x$

Step 4: **Multiply left side to determine missing side length:** $11.18 = x$

(b)



When x is on bottom

Step 1: Plug info into equation: $\cos 40^\circ = \frac{32}{x}$

Step 2: Determine Trig Ratio $.766 = \frac{32}{x}$

Step 3: **Switch left side and x:** $x = \frac{32}{.766}$

Step 4: **Divide right side to determine missing side length:** $x = 41.77$

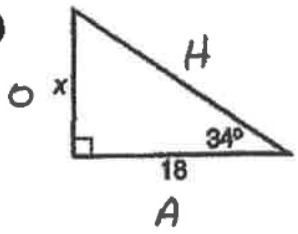
Your Turn: Use SOH CAH TOA to solve for the missing side length (x)

- TIP - label each side "Opposite", "Adjacent" and "Hypotenuse" to help you identify the proper trig ratio to use

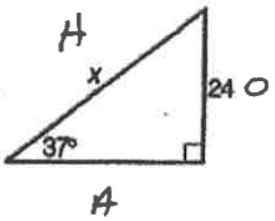
$\tan 34 = \frac{x}{18}$

42.14

(c)



(d)



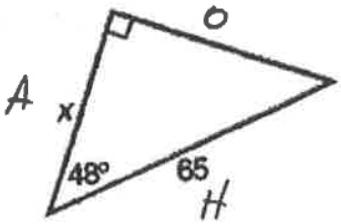
$\sin 37 = \frac{24}{x}$

39.88

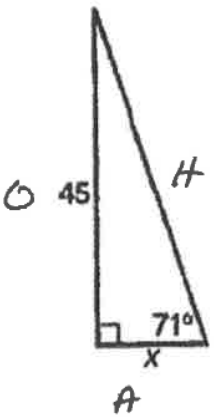
$\cos 48 = \frac{x}{65}$

43.49

(e)



(f)



$\tan 71 = \frac{45}{x}$

15.49

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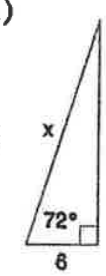
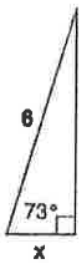
Practice **Find the missing side. Round to the nearest tenth.**

1)



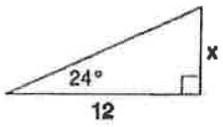
19.4

2)



1.8

3)



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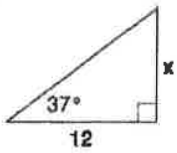

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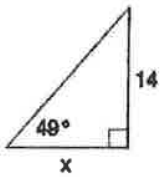
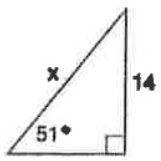
5)



12.2

6)



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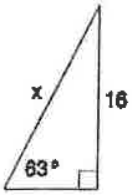
7)



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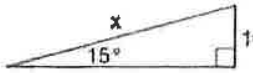

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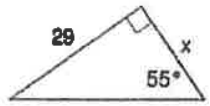
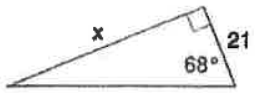
Practice **Find the missing side. Round to the nearest tenth.**

9)



20.3

10)



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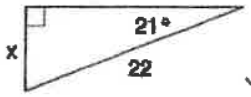
11)

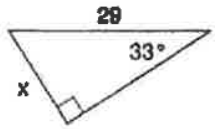
9.4

12)



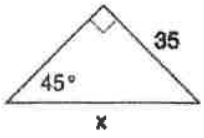
7.9

13)



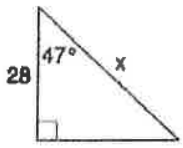
15.8

14)



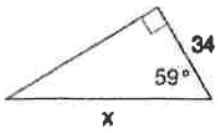
49.5

15)



41.1

16)



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