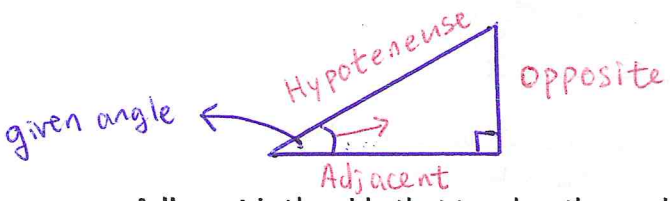
April 2

MPM2D

~~Ms. Kueh~~ Park

# Right Angle Triangles

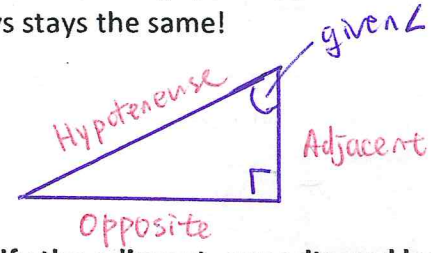
From a *given angle*, we can name the sides of a right angle triangle:



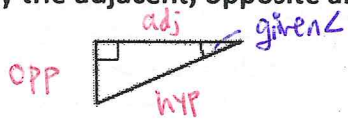

* Hypoteneuse is always opposite of right angle.

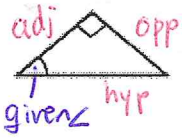
**Adjacent** is the side that touches the angle. **Opposite** is the side that does not touch the angle.

***Note:** The opposite and adjacent sides depend on the angle! If we look at the same triangle but a different angle, the opposite and adjacent sides will be different, but the Hypotenuse always stays the same!




**Identify the adjacent, opposite and hypotenuse sides for the angles in these right triangles:**

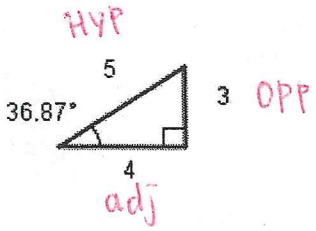


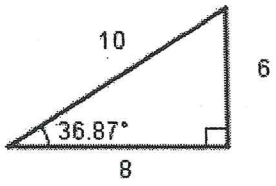



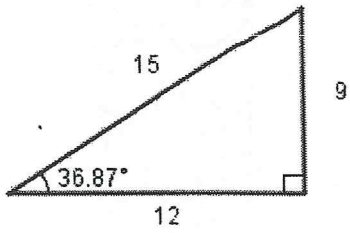


## Trigonometric Ratios

The following triangles are similar.




What do we know about the relationship between the sides of these triangles?

$$\frac{\text{OPP}}{\text{Adj}} = \frac{3}{4} = \frac{6}{8} = \frac{9}{12} = 0.75$$

$$\frac{\text{OPP}}{\text{hyp}} = \frac{3}{5} = \frac{6}{10} = \frac{9}{15} = 0.6$$

$$\frac{\text{adj}}{\text{hyp}} = \frac{4}{5} = \frac{8}{10} = \frac{12}{15} = 0.8$$

In fact, any right angle triangle with these same angles will have the same ratio! We give these ratios special names:

| Sine | Cosine | Tangent |
|---|---|---|
| $\frac{\text{Opposite}}{\text{hypotenuse}}$ | $\frac{\text{Adjacent}}{\text{Hypotenuse}}$ | $\frac{\text{Opposite}}{\text{Adjacent}}$ |

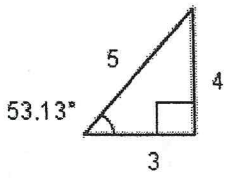
These 3 are known as the primary trig ratios.

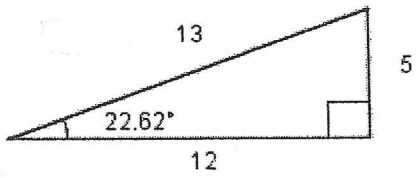
| Cosecant | Secant | Cotangent |
|---|---|---|
| $\frac{\text{Hypo}}{\text{Opp}}$ | $\frac{\text{Hyp}}{\text{Adj}}$ | $\frac{\text{Adj}}{\text{Opp}}$ |

These 3 are known as the secondary trig ratios.

*These ratios **Do Not Exist** without the specified angle!

Also, sin 53.13° and sin 22.62° refer to different sets of similar triangles.



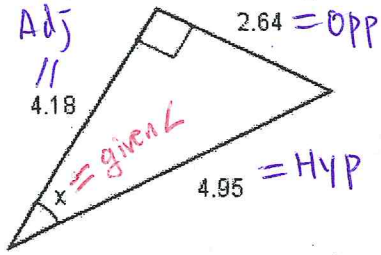




To remember the names of our primary trig ratios: $T = \frac{O}{A}$

$C = \frac{A}{H}$ $S = \frac{O}{H}$

**SOH CAH TOA**

**Example 1** For the triangle below, find




a) length of hypotenuse side 4.95

b) length of adjacent side 4.18

c) length of opposite side 2.64

d) $\sin x = \frac{\text{Opp}}{\text{hyp}} = \frac{2.64}{4.95} = 0.533$

e) $\cos x = \frac{A}{H} = \frac{4.18}{4.95} = 0.844$

f) $\tan x = \frac{\text{Opp}}{A} = \frac{2.64}{4.18} = 0.632$

**Example 2** Calculate to 4 decimal places using your calculator. mode

***A note on Calculators*** Make sure that your calculator is in **Degrees**, not Radians, or all your numbers will be wrong!

a) $\sin 55° = 0.819$

b) $\cos 34° = 0.829$

c) $\tan 15° = 0.268$

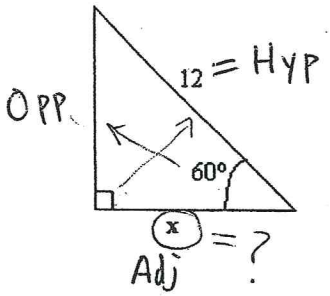
d) $\sin 115° = 0.906$

e) $\cos 90° = 0$

f) $\tan 96° = -9.51$

## Using Trigonometric Ratios to Find Sides

**Example 3**




1) First label the sides opposite, adjacent, hypotenuse.

2) Then look at the side we have, and the side we want to find.

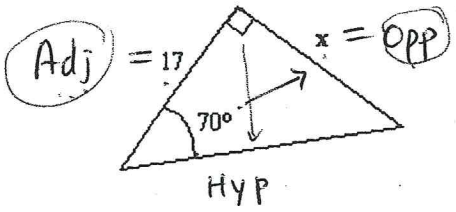
3) Check $S\frac{O}{H}\ C\frac{A}{H}\ T\frac{O}{A}$ for which ratio has Adjacent and Hypotenuse.

$$\cos 60° = \frac{A}{H} = \frac{x}{12}$$

$$12 \times 0.5 = \frac{x}{12} \times 12$$

$$6 = x$$

**Example 4** Find the side $x$.



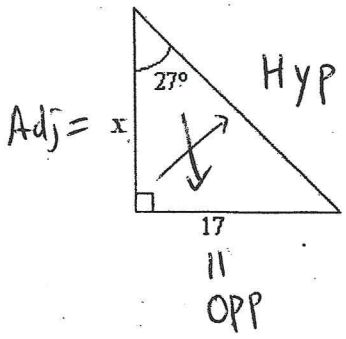

SO CA TO
H H A

$$\tan 70° = \frac{x}{17}$$

$$17 \times 2.7475 = \frac{x}{17} \times 17$$

$$46.7 = x$$

**Example 5**




SO CA TO
H H A

$$\tan 27° = \frac{O}{A} = \frac{17}{x}$$

$$x \times 0.5095 = \frac{17}{x} \times x$$

$$\frac{0.5095x}{0.5095} = \frac{17}{0.5095}$$

$$\therefore x = 33.4$$

**Homework:** Worksheet

Kuta Software - Infinite Algebra 1

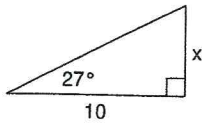
Name_____

# Using Trigonometry To Find Lengths

Date_____ Period____

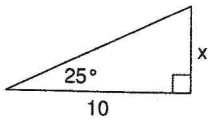
**Find the missing side. Round to the nearest tenth.**

1)



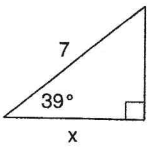

5.1

2)



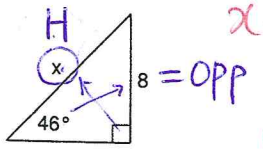

4.7

3)




5.4

4)




11.1

SOH CAH TOA

8 = OPP

$x \times \sin 46° = \frac{8}{x} \times x$

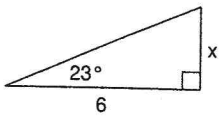
$\sin 46° \times x = 8$

$\frac{\sin 46° \times x}{\sin 46°} = \frac{8}{\sin 46°}$

$x = \frac{8}{\sin 46°}$

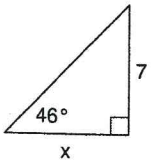
$x = 11.1$

5)



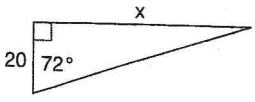

2.5

6)



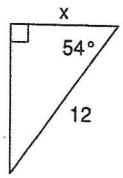

6.8

7)




61.6

8)




7.1