

**Cosecant**

**Secant**

**Cotangent**

Glue Section

S

O

H

**Sine**

C

A

**Cosine**

H

T

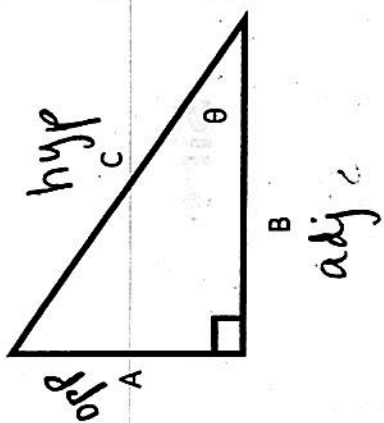
O

**Tangent**

A

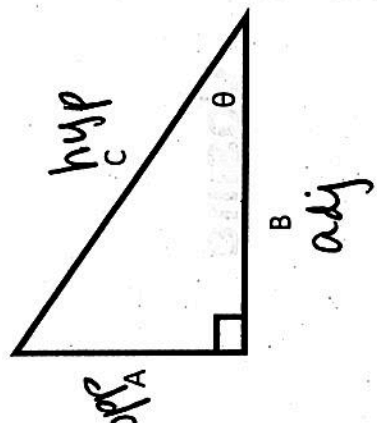
$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\text{or} \quad \sin \theta = \frac{A}{C}$$



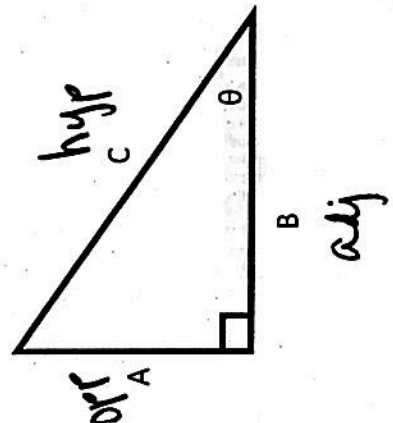
$$\cos \theta = \frac{\text{adj}}{\text{hyp}}$$

$$\text{or} \quad \cos \theta = \frac{B}{C}$$



$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

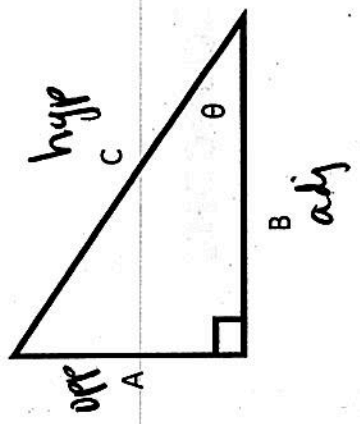
$$\text{or} \quad \tan \theta = \frac{A}{B}$$



$$\csc \theta = \frac{1}{\sin \theta}$$

$$\text{or} \quad \csc \theta = \frac{\text{hyp}}{\text{opp}}$$

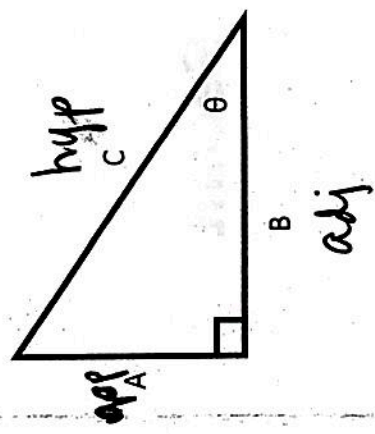
$$\text{or} \quad \csc \theta = \frac{C}{A}$$



$$\sec \theta = \frac{1}{\cos \theta}$$

$$\text{or} \quad \sec \theta = \frac{\text{hyp}}{\text{adj}}$$

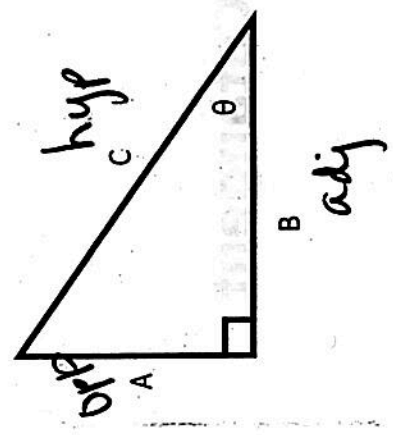
$$\text{or} \quad \sec \theta = \frac{C}{B}$$



$$\cot \theta = \frac{1}{\tan \theta}$$

$$\text{or} \quad \cot \theta = \frac{\text{adj}}{\text{opp}}$$

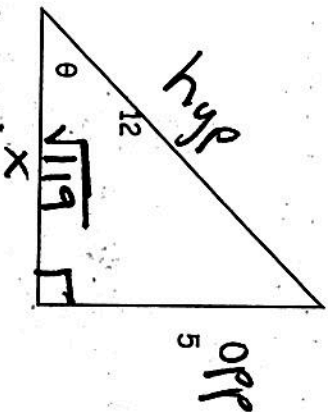
$$\text{or} \quad \cot \theta = \frac{B}{A}$$



## Right Triangle Trig.

*Degree Mode!*

**Example 1:** Find the six trigonometric ratios of  $\theta$  as shown in the figure. Give exact values, no decimals.



adj.

$$x^2 + 5^2 = 12^2 \rightarrow \sqrt{x^2} = \sqrt{119} \rightarrow x = \sqrt{119}$$

$$\sin \theta = \frac{5}{12}$$

$$\cos \theta = \frac{\sqrt{119}}{12}$$

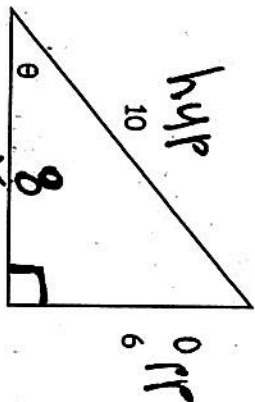
$$\tan \theta = \frac{5}{\sqrt{119}}$$

$$\csc \theta = \frac{12}{5}$$

$$\sec \theta = \frac{12}{\sqrt{119}}$$

$$\cot \theta = \frac{\sqrt{119}}{5}$$

**Example 2:** Find the six trigonometric ratios of  $\theta$  as shown in the figure. Give exact values, no decimals.



$$\sin \theta = \frac{6}{10} = \frac{3}{5}$$

$$\cos \theta = \frac{8}{10} = \frac{4}{5}$$

$$\tan \theta = \frac{6}{8} = \frac{3}{4}$$

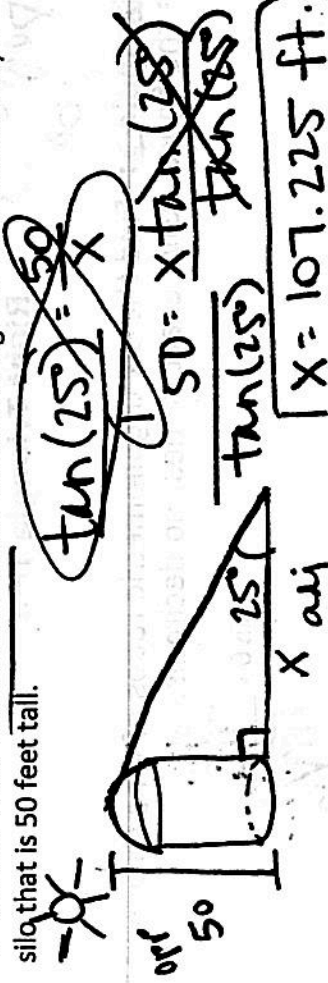
$$\csc \theta = \frac{5}{3}$$

$$\sec \theta = \frac{5}{4}$$

$$\cot \theta = \frac{4}{3}$$

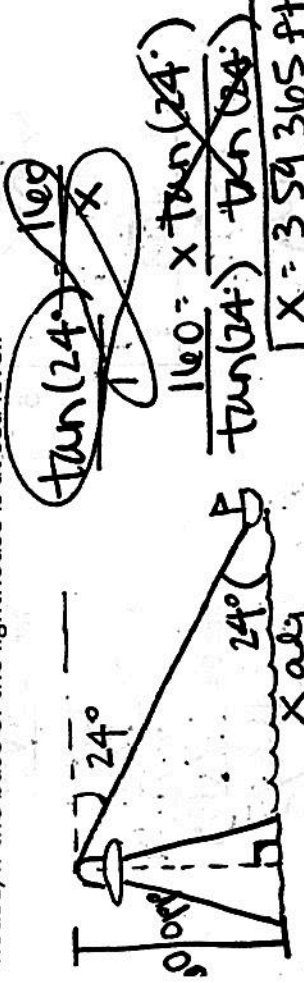
This should be blank. This gets glued down!

1. The sun is  $25^\circ$  above the horizon. Find the length of a shadow cast by a silo that is 50 feet tall.



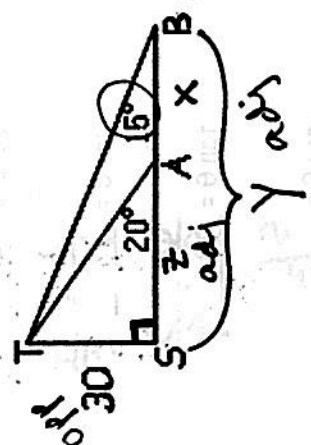
~~$\tan(25^\circ) = \frac{50}{x}$~~   
 ~~$50 = x \tan(25^\circ)$~~   
 ~~$\tan(25^\circ)$~~

2. From the top of a 160-foot lighthouse, the angle of depression of a boat out at sea is  $24^\circ$ . Find the distance from the boat to the base of the lighthouse, if the base of the lighthouse is at sea level.



~~$\tan(24^\circ) = \frac{160}{x}$~~   
 ~~$160 = x \tan(24^\circ)$~~   
 ~~$\tan(24^\circ)$~~

3. Observers at A and B find the angles of elevation to the top of a 30 m tower to be  $20^\circ$  and  $15^\circ$  respectively. If S, A, and B are collinear, how far apart are A and B?



~~$\tan(15^\circ) = \frac{30}{y}$~~   
 ~~$30 = y \tan(15^\circ)$~~   
 ~~$\tan(15^\circ)$~~

~~$\tan(20^\circ) = \frac{30}{z}$~~   
 ~~$30 = z \tan(20^\circ)$~~   
 ~~$\tan(20^\circ)$~~

~~$y = 111.961...$~~

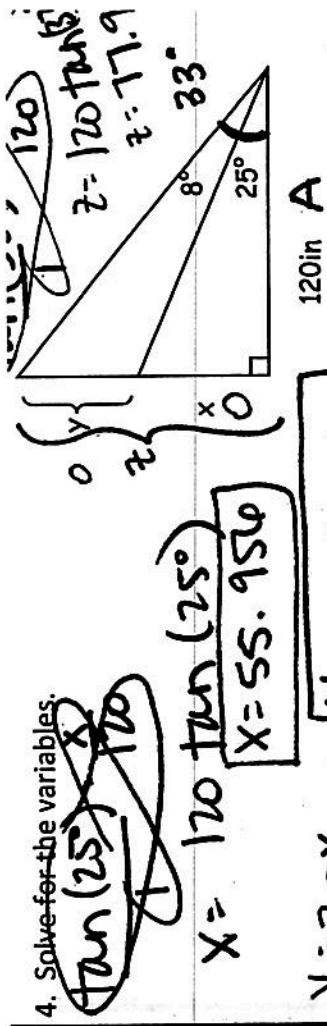
~~$30 = z \tan(20^\circ)$~~   
 ~~$\tan(20^\circ) \tan(20^\circ)$~~

$x = y - z$

$x = 29.537 \text{ m}$

$z = 82.424...$

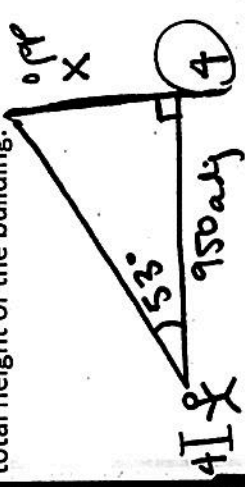
4. Solve for the variables.



~~$\tan(25^\circ) = \frac{120}{x}$~~   
 ~~$x = 120 \tan(25^\circ)$~~   
 ~~$x = 55.950$~~

$y = z - x \rightarrow y = 21.971 \text{ in}$

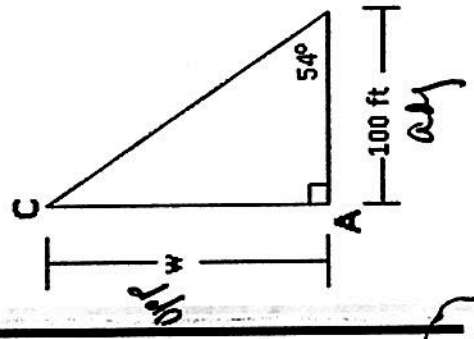
5. A boy visiting New York City views the Empire State Building 950 feet away from the foot of the building. The angle of elevation of the top of the building, as seen by the boy, contains  $53^\circ$ . The boy is 4 feet tall. Find the total height of the building.



~~$\tan(53^\circ) = \frac{x}{950}$~~   
 ~~$x = 950 \tan(53^\circ)$~~   
 ~~$x = 1260.692 \text{ ft}$~~

$1264.692 \text{ ft}$

6. A biologist wants to know the width  $w$  of a river so in order to properly set instruments for studying the pollutants in the water. From point A, the biologist walks downstream 100 feet and sights to point C. From this sighting, it is determined that  $q = 54^\circ$ . How wide is the river?



~~$\tan(54^\circ) = \frac{w}{100}$~~   
 ~~$w = 100 \tan(54^\circ)$~~   
 ~~$= 137.638 \text{ ft}$~~

$w = 137.638 \text{ ft}$