

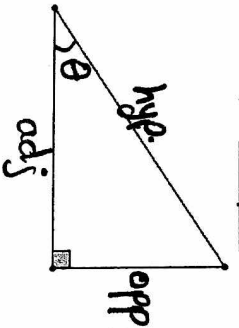
# SOCATA

The six trigonometric functions of a right triangle, with an acute angle  $\theta$ , are defined by the **ratio** of two sides of the triangle.

The sides of the right triangle are:

- The side **opposite** the acute angle  $\theta$ ,
- The side **adjacent** to the acute angle  $\theta$ ,
- And the **hypotenuse** of the right triangle.

**hypotenuse**



The six trigonometric functions are:

1. Sine  $\sin \theta = \frac{\text{opp}}{\text{hyp}}$
2. Cosine  $\cos \theta = \frac{\text{adj}}{\text{hyp}}$
3. Tangent  $\tan \theta = \frac{\text{opp}}{\text{adj}}$
4. Cosecant  $\csc \theta = \frac{\text{hyp}}{\text{opp}}$
5. Secant  $\sec \theta = \frac{\text{hyp}}{\text{adj}}$
6. Cotangent  $\cot \theta = \frac{\text{adj}}{\text{opp}}$

Reciprocal functions: another way to look at it!

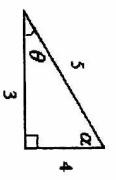
1.  $\sin \theta = \frac{1}{\csc \theta}$
2.  $\cos \theta = \frac{1}{\sec \theta}$
3.  $\tan \theta = \frac{1}{\cot \theta}$
4.  $\csc \theta = \frac{1}{\sin \theta}$
5.  $\sec \theta = \frac{1}{\cos \theta}$
6.  $\cot \theta = \frac{1}{\tan \theta}$

Given 2 sides of a right triangle you should be able to find the value of all 6 trigonometric functions.

1.  $5^2 + 12^2 = c^2$   
 $169 = c^2$   
 $13 = c$

2.  $13 = c$   
 $12$

$\sin \theta = \frac{5}{13}$   
 $\cos \theta = \frac{12}{13}$   
 $\tan \theta = \frac{5}{12}$   
 $\csc \theta = \frac{13}{5}$   
 $\sec \theta = \frac{13}{12}$   
 $\cot \theta = \frac{12}{5}$



$\theta$        $\alpha$

$\sin \theta = \frac{4}{5}$        $\sin \alpha = \frac{3}{5}$   
 $\cos \theta = \frac{3}{5}$        $\cos \alpha = \frac{4}{5}$   
 $\tan \theta = \frac{4}{3}$        $\tan \alpha = \frac{3}{4}$   
 $\csc \theta = \frac{5}{4}$        $\csc \alpha = \frac{5}{3}$   
 $\sec \theta = \frac{5}{3}$        $\sec \alpha = \frac{5}{4}$   
 $\cot \theta = \frac{3}{4}$        $\cot \alpha = \frac{4}{3}$

### A. Solve for Missing Sides

1)  $\cos 6^\circ = \frac{a}{13}$   
 $a = 13 \cos 6^\circ$

2)  $\sin 35^\circ = \frac{6}{b}$   
 $b = \frac{6}{\sin 35^\circ} = 10.46 \text{ cm}$

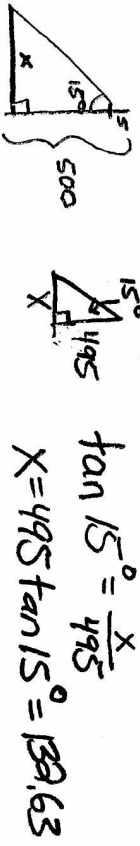
### B. Solve for Missing Angles

3)  $\cos \theta = \frac{34}{39}$   
 $\theta = 29.33^\circ$

4)  $\tan \theta = \frac{16}{23}$   
 $\theta = 34.82^\circ$

### C. Applications

5. To secure a 500-meter radio tower against high winds, guy wires are attached to a ring 5 meters from the top of the tower. The wires form a  $15^\circ$  angle with the tower. Find the distance from the tower to the guy wire anchor in the ground.



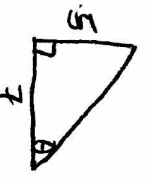
6. A trolley car track rises vertically 40 feet over a horizontal distance of 630 feet. What is the angle of elevation of the track?



### D. Find Remaining Ratios

7.  $\csc \theta = \frac{41}{40}$        $\sin \theta = \frac{40}{41}$   
 $\sec \theta = \frac{41}{9}$        $\cos \theta = \frac{9}{41}$   
 $\cot \theta = \frac{9}{40}$        $\tan \theta = \frac{40}{9}$

8.  $\tan \theta = \frac{5}{7}$   
 $\cot \theta = \frac{7}{5}$   
 $\sin \theta = \frac{5}{\sqrt{74}}$   
 $\csc \theta = \frac{\sqrt{74}}{5}$   
 $\cos \theta = \frac{7}{\sqrt{74}}$   
 $\sec \theta = \frac{\sqrt{74}}{7}$



$c = \sqrt{49+25}$   
 $c = \sqrt{74}$