

LESSON #2: ASTC AND RECIPROCAL FUNCTIONS

Do Now:

Recall from yesterday's lesson:

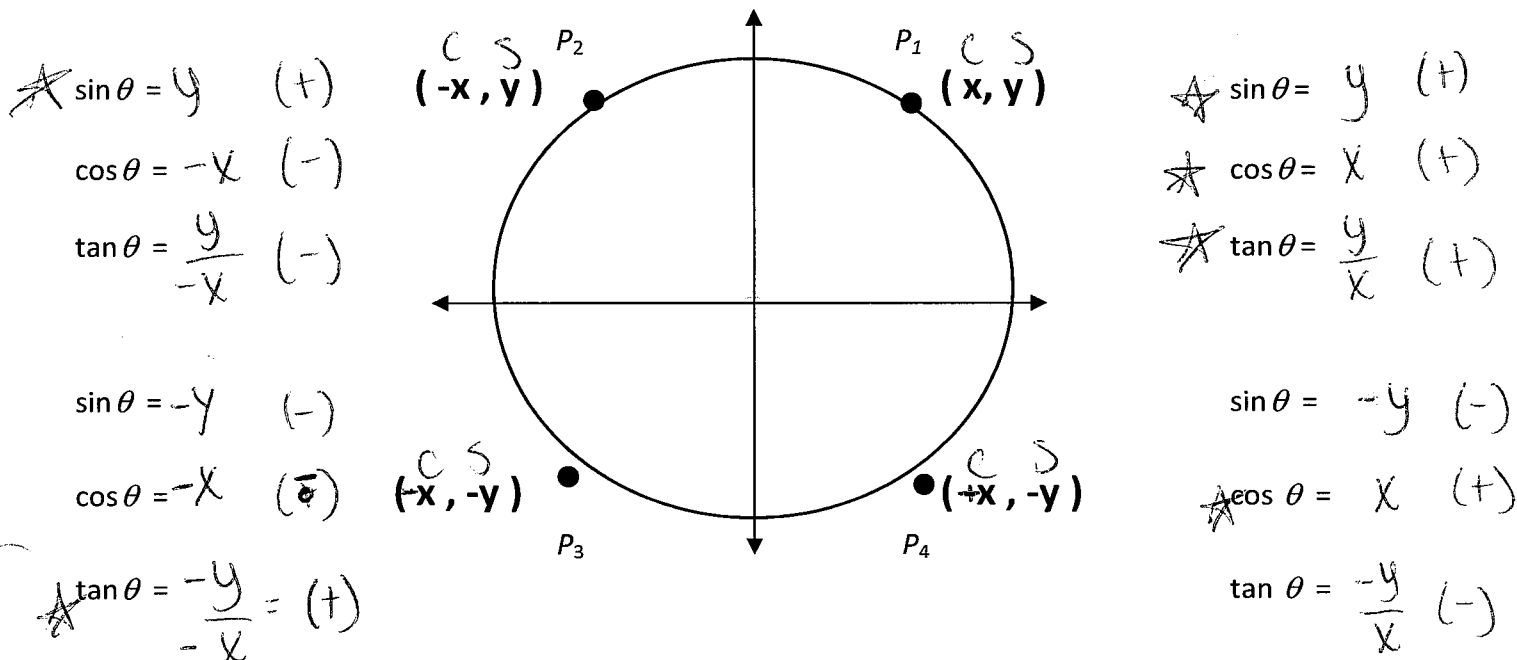
a) $\sin \theta = \underline{y}$ - coordinate

b) $\cos \theta = \underline{x}$ - coordinate

c) $\tan \theta = \frac{\sin \theta}{\cos \theta}$ or $\frac{y}{x}$

AIM #1: DETERMINING THE SIGNS OF THE TRIG FUNCTIONS IN DIFFERENT QUADRANTS

Let's determine the SIGNS of sine, cosine, and tangent in each quadrant using each point on the unit circle!



In the following diagram we will list the functions that are **POSITIVE** in each quadrant.



"All Star Trig Class"

AIM #2: RECIPROCAL TRIG FUNCTIONS

FUNCTION	RECIPROCAL	RECIPROCAL FUNCTION
COSINE ($\cos \theta$)	$\frac{1}{\cos \theta}$	$\sec \theta$
SINE ($\sin \theta$)	$\frac{1}{\sin \theta}$	$\csc \theta$
TANGENT ($\tan \theta$)	$\frac{1}{\tan \theta}$	$\cot \theta$ or $\frac{\cot \theta}{\sin \theta}$

1) Given the right triangle below find the following:

a) $\sin \theta = \frac{5}{13}$

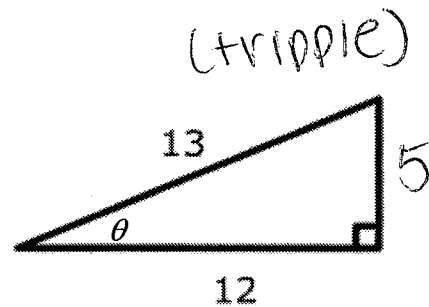
d) $\csc \theta = \frac{13}{5}$

b) $\cos \theta = \frac{12}{13}$

e) $\sec \theta = \frac{13}{12}$

c) $\tan \theta = \frac{5}{12}$

f) $\cot \theta = \frac{12}{5}$



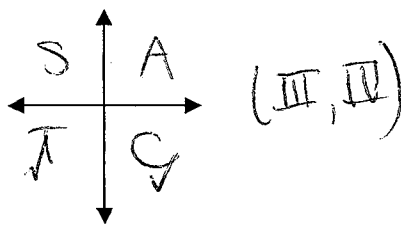
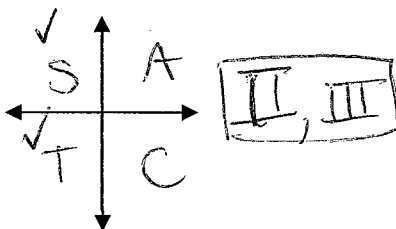
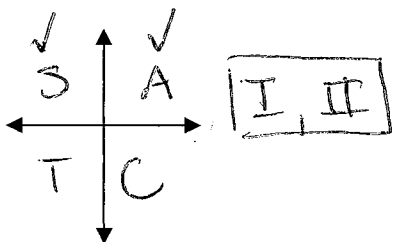
2) Does the sign (+/-) change between trig functions and their reciprocals? Go back to the chart on the front and include the reciprocal trig functions. **NO!**

3) Name the quadrants in which θ could be in if:

a) $\sin \theta > 0$ (+)

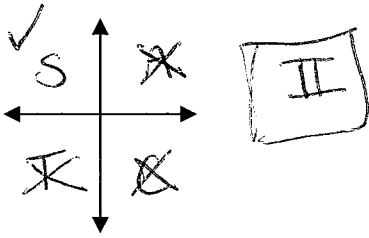
b) $\cos \theta < 0$ (-)

c) $\csc \theta < 0$ (-)

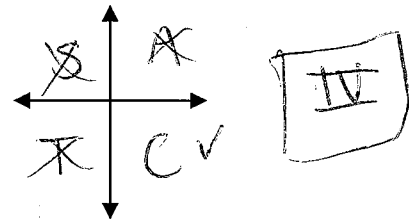


4) Name the quadrant that θ is in if:

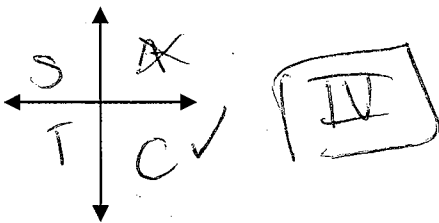
a) $\sin \theta > 0$ and $\cos \theta < 0$



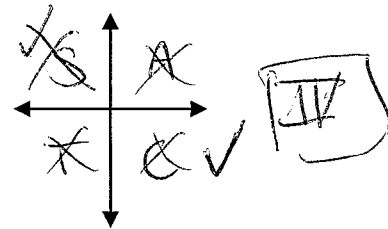
b) $\cos \theta > \frac{\sqrt{3}}{2}$ and $\tan \theta < 0$



c) $\csc \theta < 0$ and $\tan \theta = -1$

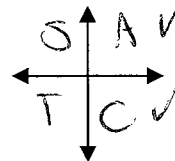
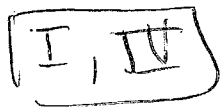


d) $\cot \theta < 0$ and $\sec \theta > 0$

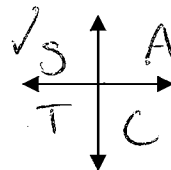


PRACTICE:

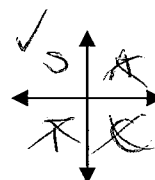
5) If $\sec \theta > 0$, in which quadrants could θ lie?
 $\cos \theta$



6) If $\sin \theta > 0$ and $\cos \theta < 0$, in which quadrant does θ lie?
 $\sin \theta$ $\cos \theta$



7) If $\sec \theta < 0$ and $\cot \theta < 0$, in which quadrant does θ lie?
 $\cos \theta$ $\tan \theta$



8) If $\cos x = \frac{1}{a}$, $a \neq 0$, which statement must be true?

- 1) ~~$\csc x = a$~~
- 2) ~~$\csc x = -\frac{1}{a}$~~
- 3) $\sec x = a$
- 4) ~~$\sec x = -\frac{1}{a}$~~

9) If $\csc \theta = -2$, what is the value of $\sin \theta$?

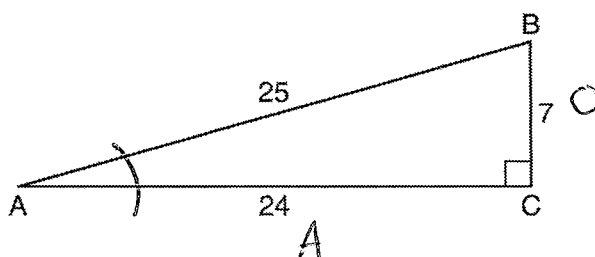
- 1) -2
- 2) 2
- 3) $-\frac{1}{2}$
- 4) $\frac{1}{2}$

10) Which ratio represents $\cot A$ in the diagram below?

- 1) $\frac{25}{24}$
- 2) $\frac{25}{7}$
- 3) $\frac{24}{7}$
- 4) $\frac{7}{24}$

$$\tan A = \frac{7}{24}$$

$$\cot A = \frac{24}{7}$$



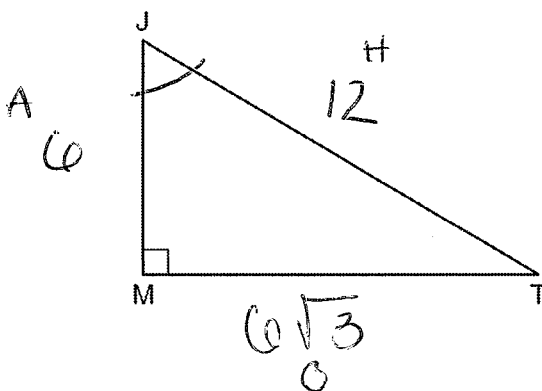
11) In the diagram below of right triangle JTM , $JT = 12$, $JM = 6$, and $m\angle JMT = 90$.

What is the value of $\sec J$?

- 1) $\frac{\sqrt{3}}{3}$
- 2) 2
- 3) $\sqrt{3}$
- 4) $\frac{2\sqrt{3}}{3}$

$$\cos J = \frac{6}{12}$$

$$\sec J = \frac{12}{6} = 2$$



12) Now find the exact value of $\cot J$ of right triangle JTM above.

$$6^2 + x^2 = 12^2 \rightarrow \text{NO DECIMALS!}$$

$$\sqrt{x^2} = \sqrt{108}$$

$$x = \sqrt{36 \cdot 3}$$

$$x = 6\sqrt{3}$$

$$\tan J = \frac{6\sqrt{3}}{6}$$

$$\cot J = \frac{6}{6\sqrt{3}} = \boxed{\frac{1}{\sqrt{3}}}$$