

Warm up

Find the trig ratio for the following:

1. $\sin \frac{\pi}{3}$

2. $\cos \frac{\pi}{4}$

3. $\csc \frac{\pi}{6}$

4. $\tan 30^\circ$

5. $\sec 45^\circ$

6. $\cot 45^\circ$

Find θ in degrees.

7. $\sin \theta = \frac{1}{\sqrt{2}}$

8. $\csc \theta = \frac{2}{\sqrt{3}}$

9. $\cot \theta = \sqrt{3}$

10. $\cos \theta = \frac{1}{2}$

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4.4 Trig Functions of any angle Day 1

trig ratios for angles > 90 or $\frac{\pi}{2}$

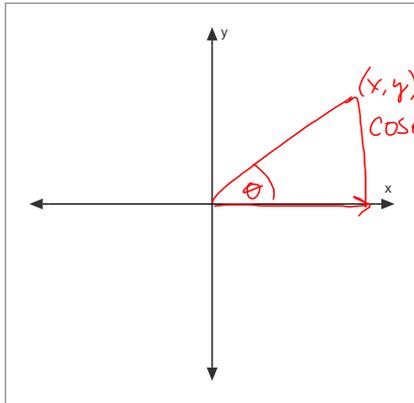
ASTC

Quadrant angle values

What quadrant am I in?

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So far we have talked only about trig ratios of acute angles. What if the angle I want to evaluate is obtuse?



Remember that on the unit circle

$$(x, y) = (\cos \theta, \sin \theta)$$

$$= (\text{adj side}, \text{opp side})$$

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Example: Let (5, -12) be a point on the terminal side of angle θ , find $\sin \theta$, $\cos \theta$, $\tan \theta$

Step 1: Draw a triangle with the x-axis

Step 2: Find the third side

using pythagorean theorem

Step 3: Find the ratios

$\sin \theta$	$\cos \theta$	$\tan \theta$
$-\frac{12}{13}$	$\frac{5}{13}$	$-\frac{5}{12}$

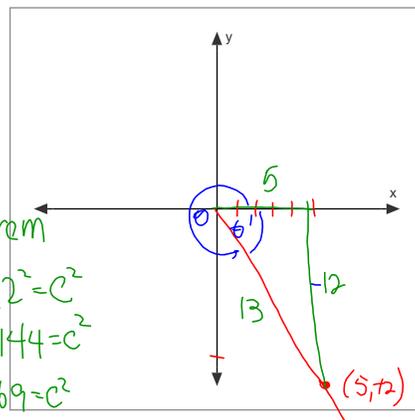
$$5^2 + 12^2 = c^2$$

$$25 + 144 = c^2$$

$$169 = c^2$$

$$\sqrt{169} = c$$

$13 = c \Rightarrow$ always positive



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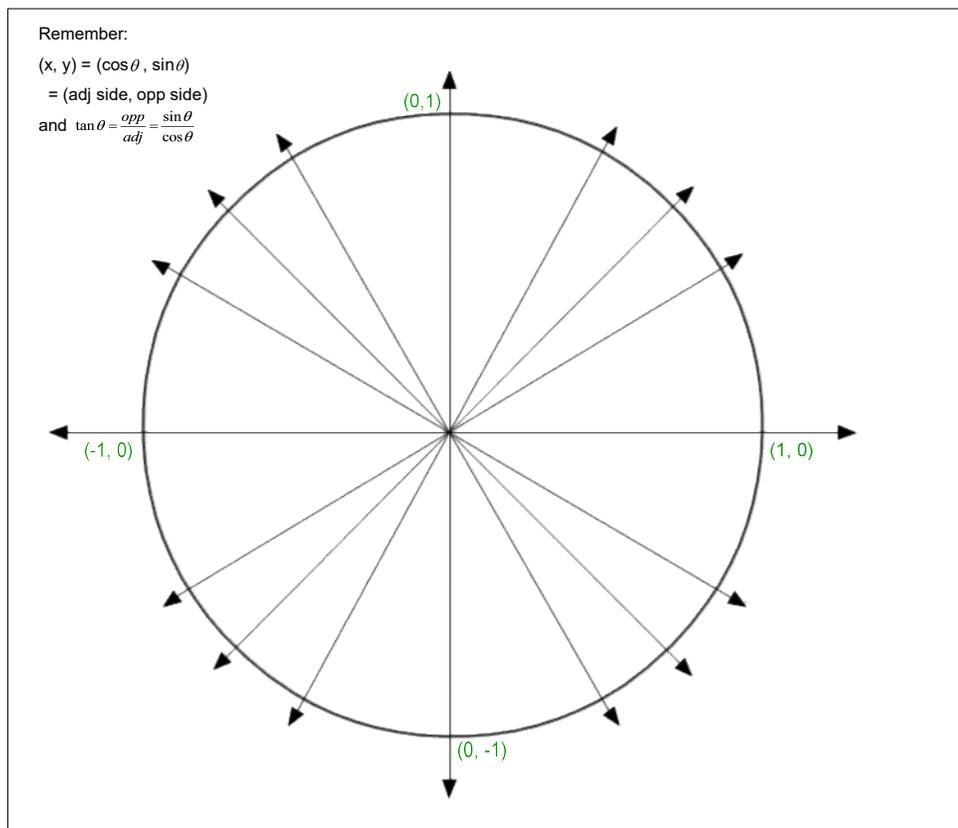
ASTC = what is positive in each quadrant

$(x, y) = (\cos \theta, \sin \theta)$
 = (adj side, opp side)

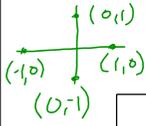
$\frac{\sin \theta}{\cos \theta} = \tan \theta$

<u>STUDENTS</u>	<u>ALL</u>
$\sin \theta +$	$\sin \theta +$
$\cos \theta -$	$\cos \theta +$
$\tan \theta -$	$\tan \theta +$
$\sin \theta -$	$\cos \theta +$
$\cos \theta -$	$\sin \theta -$
$\tan \theta +$	$\tan \theta -$
<u>TAKE</u>	<u>CALCULUS</u>

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$\frac{0}{1} \rightarrow \frac{1}{0}$

	0, 360 or 0, 2π	90 or $\pi/2$	180 or π	270 or $3\pi/2$
sin θ	0	1	0	-1
cos θ	1	0	-1	0
tan θ	0	und	0	und
csc θ	und	1	und	-1
sec θ	1	und	-1	und
cot θ	und	0	und	0

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What quadrant am I in??

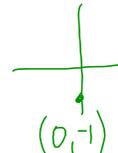
sin $\theta > 0$ tan $\theta > 0$ I
~~I~~ II ~~I~~ III

cos $\theta < 0$ sin $\theta < 0$ III
 II ~~III~~ ~~III~~ IV

sec $\theta < 0$ cot $\theta < 0$ II

cos $\theta < 0$ tan $\theta < 0$
~~II~~ III ~~II~~ IV

$\sin 270^\circ = -1$



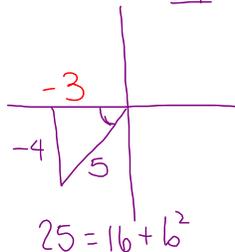
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find the remaining 5 trig ratios (values) given:

$$\sin \theta = -\frac{4}{5}, \quad \cos \theta < 0$$

III IV II III

III



draw a Δ in Q3

Load information

Find 3rd side

$$\begin{aligned} \text{(given)} \sin \theta &= -\frac{4}{5} & \csc \theta &= -\frac{5}{4} \\ \cos \theta &= -\frac{3}{5} & \sec \theta &= -\frac{5}{3} \\ \text{Q3} \rightarrow \tan \theta &= \frac{4}{3} & \cot \theta &= \frac{3}{4} \end{aligned}$$

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HOMework



p 294

1-21 odd, 29-36 all

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GO COUGARS! 

Homework Questions

13. (a)  (b) 

14. (a) $\frac{3}{5}$ (b) $\frac{4}{5}$

In Exercises 15-26, find (if possible) the complement and supplement of the angle.

15. $\frac{\pi}{6}$ (b) $\frac{5\pi}{6}$
 16. $\frac{\pi}{4}$ (b) $\frac{3\pi}{4}$
 17. $\frac{\pi}{3}$ (b) $\frac{2\pi}{3}$

In Exercises 7-14, sketch a right triangle corresponding to the trigonometric function of the acute angle θ . Use the Pythagorean Theorem to determine the third side of the triangle and then find the other five trigonometric functions of θ .

8. $\cos \theta = \frac{1}{2}$ (b) $\cos \theta = \frac{5}{13}$
 11. $\sec \theta = 4$ (b) $\csc \theta = \frac{17}{8}$
 13. $\tan \theta = 7$ (b) $\csc \theta = \frac{25}{24}$
 15. $\csc \theta = \frac{5}{4}$ (b) $\sec \theta = \frac{5}{3}$

In Exercises 37-42, use a calculator to evaluate each function. Round your answers to four decimal places. (Be sure the calculator is in the correct angle mode.)

37. (a) $\sin 41^\circ$ (b) $\cos 67^\circ$
 38. (a) $\tan 18.5^\circ$ (b) $\cot 71.9^\circ$
 39. (a) $\sec 42^\circ 21'$ (b) $\csc 48^\circ 17'$
 40. (a) $\csc 87^\circ 50' 25''$ (b) $\sec 8^\circ 50' 25''$

41. (a) $\cot \frac{\pi}{6}$ (b) $\tan \frac{\pi}{8}$
 42. (a) $\sec 1.54$ (b) $\csc 1.25$

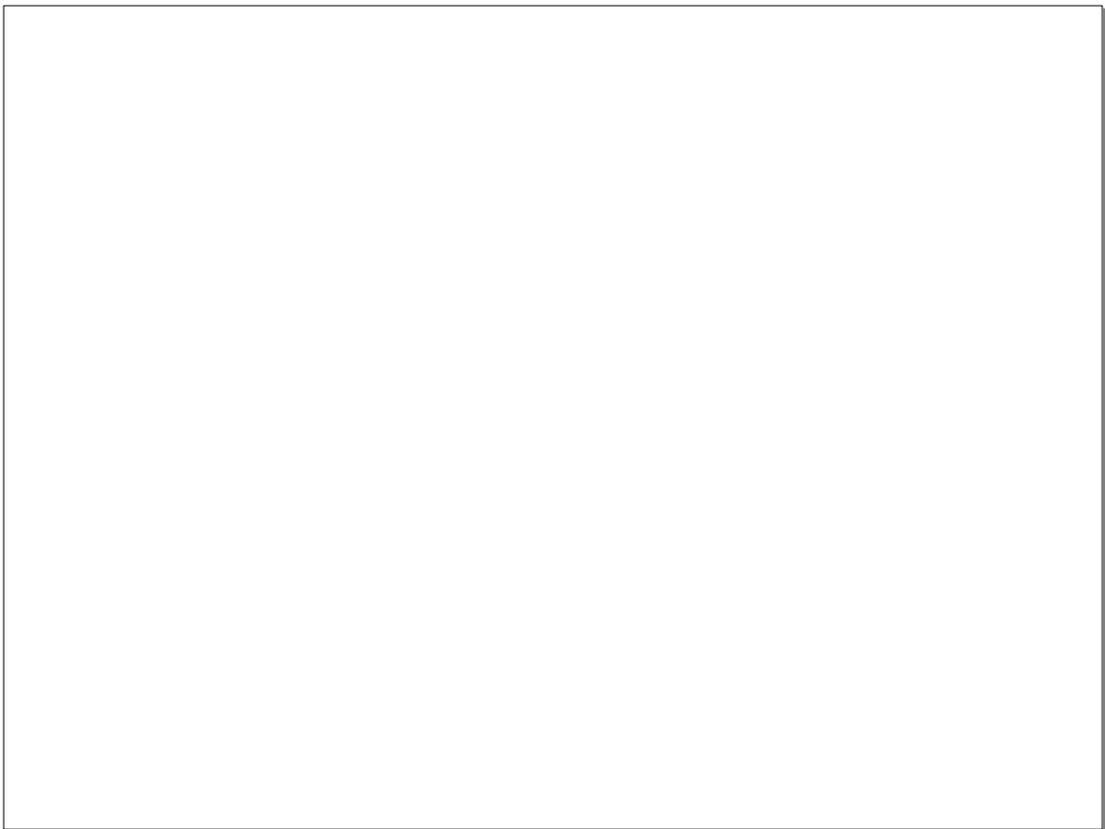
Workshop Activities

1. 77.75 radians (b) 12.89 radians
 3. 1441.94 radians (b) 14.29 minutes
 42. 211.6 cm/sec
 5a. 5.28 cm/sec (b) 104.12 radians
 5b. 8.73 cm/sec
 7. 17.45 ft/sec (b) 10.88 rad/sec
 9. 17222.54 rpm (b) 728.28 rev/min

4.1 Linear & Angular Speeds WS #3

- A wheel rotates 1.23 revolutions per minute. Find the angular speed in radians of a point on the wheel.
- Determine the angular speed in radians per second of a wheel turning 124 revolutions per minute.
- Determine the number of revolutions per minute of the wheel rotating 151 rad/s.
- Determine linear speed of a point rotating at the given angular speed at a distance (radius) from the axis of rotation.
 A) $r=1.3m$ $\omega=3.5x \text{ rad/s}$ B) $r=9.2cm$ $\omega=23 \text{ rad/s}$
- Determine the linear speed of a point on a circle r units from the center that moves through an angle θ in t min. Express answer in cm/s.
 A) $r=22cm$ $\theta=1.4x \text{ rad}$ B) $r=1.2 \text{ m}$ $\theta=250^\circ$
- If an engine is making 1000rpm, what is the angular speed of the engine's crank shaft in radians/sec.
- A Ferris wheel 250 ft in diameter makes one revolution every 45 seconds. Determine the linear speed of a car on the rim of the wheel.
- A large merry-go-around is four horses deep. What seat should a child choose for the fastest ride? For the slowest?
- Astronomy: A space telescope travels about the earth in a circular orbit at a distance of 380 mi from the earth's surface. It makes one orbit every 95 min. Find its linear speed in mph. (the radius of the earth is approximately 3960 mi).
- A car is moving at a speed of 65 mph. the diameter of the wheels is 23.5 in. Find the angular speed of the wheel in radians per minute and find the number of revolutions per minute the wheels are rotating.

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