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. $\tan 30°$
5. $\sec 45°$
6. $\cot 45°$

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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GO COUGARS!

p 308 Homework Questions

In Exercises 5–8, find the exact values of the six trigonometric functions of the angle θ for each of the two triangles. Explain why the function values are the same.

5.

In Exercises 9–16, sketch a right triangle corresponding to the trigonometric function of the acute angle θ. Use the Pythagorean Theorem to determine the third side and then find the other five trigonometric functions of θ.

9. $\sin\theta = \frac{1}{3}$
11. $\sec\theta = 2$
13. $\tan\theta = 3$
15. $\cot\theta = \frac{1}{3}$

In Exercises 17–26, construct an appropriate triangle to complete the table. ($0° < \theta < 90°$, $0 < \theta < \pi/2$)

Function	θ (deg)	θ (rad)	Function Value
17. sin	30°		
19. tan			
21. cot	60	$\frac{\pi}{3}$	$\frac{\sqrt{3}}{3} = \frac{1}{\sqrt{3}}$
23. cos			
25. cot	45	$\frac{\pi}{4}$	1

In Exercises 43–52, use a calculator to evaluate each function. Round your answers to four decimal places. (Be sure the calculator is in the correct angle mode.)

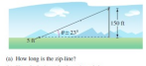
51. (a) csc 32° 40′ 3″

In Exercises 53–58, find the values of θ in degrees ($0° < \theta < 90°$) and radians ($0 < \theta < \pi/2$) without the aid of a calculator.

53. (a) $\sin\theta = \frac{1}{2}$ (b) $\csc\theta = 2$
54. (a) $\cos\theta = \frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}}$ (b) $\tan\theta = 1$
55. (a) $\sec\theta = 2$ (b) $\cot\theta = 1$
56. (a) $\tan\theta = \sqrt{3}$ (b) $\cos\theta = \frac{1}{2}$
57. (a) $\csc\theta = \frac{2\sqrt{3}}{3}$ (b) $\sin\theta = \frac{\sqrt{2}}{2}$
58. (a) $\cot\theta = \frac{\sqrt{3}}{3}$ (b) $\sec\theta = \sqrt{2}$

65. *Empire State Building* You are standing 45 meters from the base of the Empire State Building. You estimate that the angle of elevation to the top of the 86th floor (the observatory) is 82°. If the total height of the building is another 123 meters above the 86th floor, what is the approximate height of the building? One of your friends is on the 86th floor. What is the distance between you and your friend?

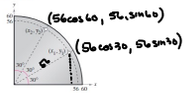
67. *Length* A steel cable zip-line is being constructed for a competition on a reality television show. One end of the zip-line is attached to a platform on top of a 150-foot pole. The other end of the zip-line is attached to the top of a 5-foot stake. The angle of elevation to the platform is 23° (see figure).



$\sin 23 = \frac{145}{z}$ $\quad z = \frac{145}{\sin 23}$ $\quad \tan 23 = \frac{145}{a}$

(a) How long is the zip-line?
(b) How far is the stake from the pole?
(c) Contestants take an average of 6 seconds to reach the ground from the top of the zip-line. At what rate are contestants moving down the line? At what rate are they dropping vertically?

69. *Machine Shop Calculations* A steel plate has the form of one-fourth of a circle with a radius of 60 centimeters. Two two-centimeter holes are to be drilled in the plate positioned as shown in the figure. Find the coordinates of the center of each hole.



Feb 2-9:51 PM

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?

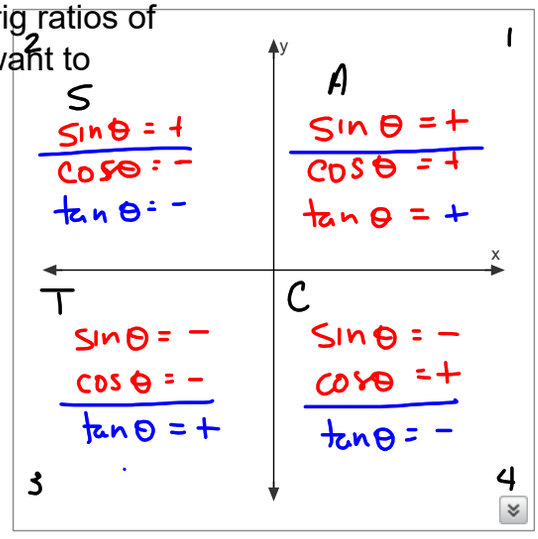
Jan 4-3:55 PM

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

ASTC

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

= (adj side, opp side)



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

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

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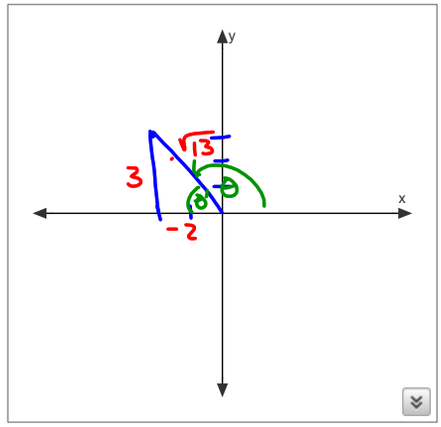
Example: Let (-2, 3) be a point on the terminal side of angle θ, find $\sin\theta$, $\cos\theta$, $\tan\theta$

Step 1: Draw a triangle with the x-axis

Step 2: Find the third side

Step 3: Find the ratios



$\sin\theta = \sin\theta' = \frac{3}{\sqrt{13}}$

$\cos\theta = \cos\theta' = \frac{-2}{\sqrt{13}}$

$\tan\theta = \tan\theta' = -\frac{3}{2}$

Jan 4-4:05 PM

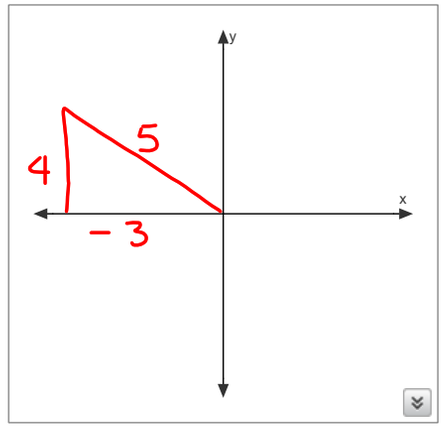
Given $\sin\theta = \frac{4}{5}$, $\tan\theta < 0$ find the trig ratios (values) for cos θ, csc θ, cot θ.

Q1 Q2 Q2, 4

Step 1: Draw a triangle with the x-axis

Step 2: Find the third side and label (watch your signs!)

Step 3: Find the ratios



$\cos\theta = -\frac{3}{5}$ $\csc\theta = \frac{5}{4}$ $\cot\theta = -\frac{3}{4}$

Jan 4-4:29 PM

What quadrant am I in??

$\sin\theta > 0$ $\tan\theta > 0$ Q1

Q1, 2 Q1, 3

$\cos\theta < 0$ $\sin\theta < 0$ Q3

Q2, 3 Q3, 4

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

$\cos\theta < 0$ $\tan\theta < 0$ Q2

Q2, 3 Q2, 4

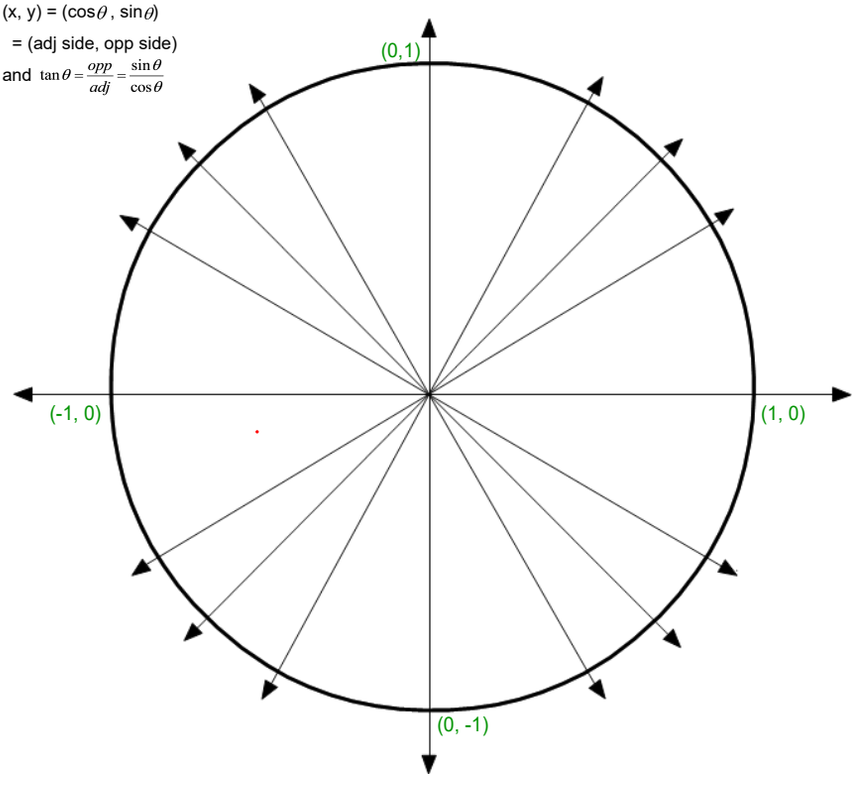
Jan 4-4:23 PM

Remember:

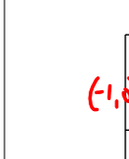
(x, y) = ($\cos\theta$, $\sin\theta$)

= (adj side, opp side)

and $\tan\theta = \frac{opp}{adj} = \frac{\sin\theta}{\cos\theta}$



Jan 11-2:00 PM



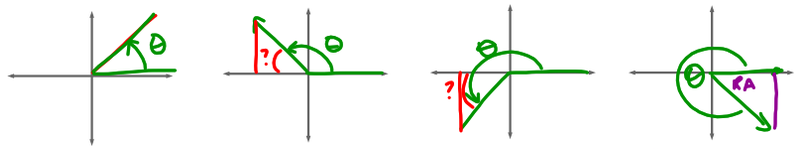
	0, 360 or 0, 2π	90 or π/2	180 or π	270 or 3π/2
sin θ	0	1	0	-1
cos θ	1	0	-1	0
tan θ	0	und	0	und
csc θ	und	1	und	-1
sec θ	1	und	-1	und
cot θ	und	0	und	0

$\frac{0}{T} \Rightarrow \frac{+}{0}$

Jan 22-5:46 AM

Reference Angle - the angle formed by the terminal side of an angle and the closest x-axis

A reference angle is always positive. and acute



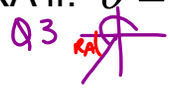
RA in Q 1 = θ

RA in Q 2: 180 - θ, π - θ, 3.14 - θ

RA in Q 3: θ - 180, θ - π, θ - 3.14

RA in Q 4: 360 - θ, 2π - θ, 6.28 - θ

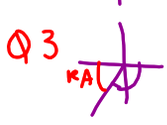
Find RA if: $\theta = 213°$

Q3 

213 - 180 = 33

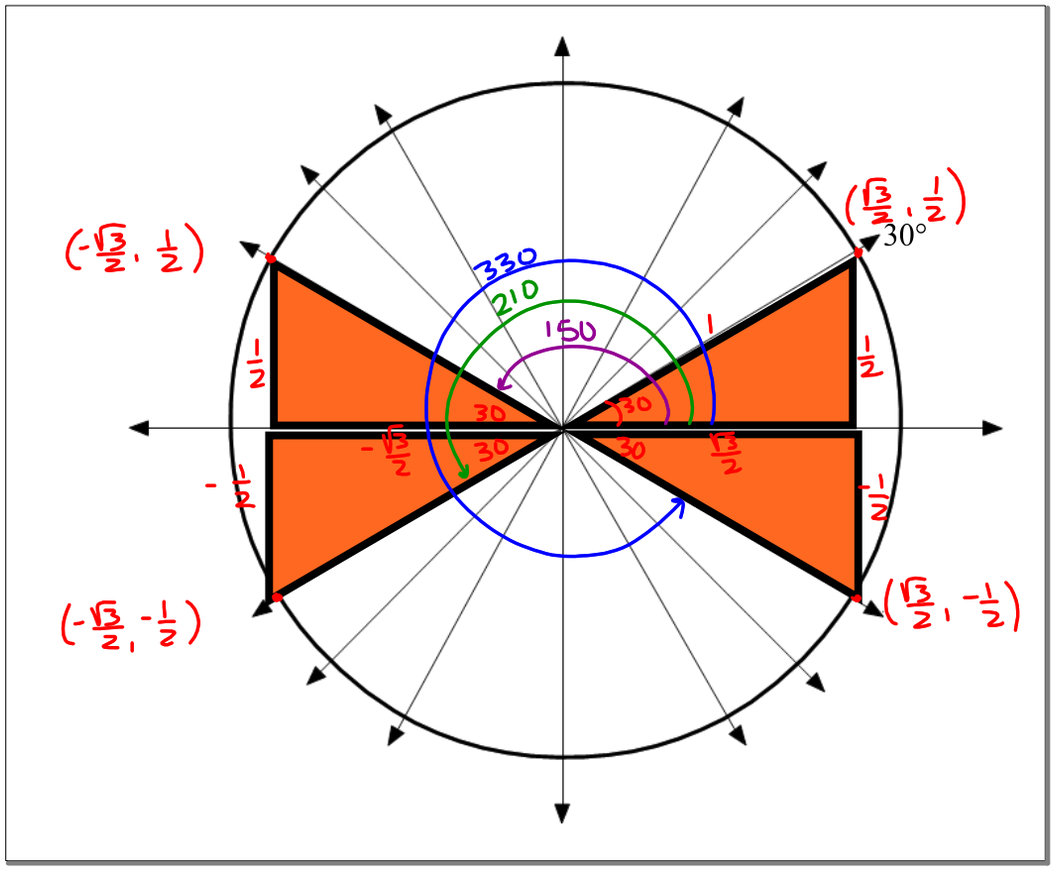
Q2 

$\theta = 1.7$ 3.14 - 1.7 = 1.44

Q3 

$\theta = -\frac{5\pi}{7}$ $\pi - \frac{5\pi}{7} = \frac{2\pi}{7}$

Jan 5-6:05 AM



Jan 3-2:37 PM

HOMEWORK

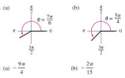
p 318 3-27 odd, 37-43 odd

Workbook p 41 1-15 odd

Feb 2-9:51 PM

GO COUGARS!

Homework Questions

12. (a)  (b) 

13. (a) $-\frac{9\pi}{4}$ (b) $-\frac{7\pi}{15}$

14. (a) $\frac{7\pi}{4}$ (b) $\frac{8\pi}{15}$

In Exercises 15–20, find (if possible) the complement and supplement of the angle.

15. $\frac{\pi}{3}$ **16.** $\frac{3\pi}{4}$

17. $\frac{\pi}{6}$ **18.** $\frac{3\pi}{5}$

In Exercises 9–16, 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.

9. $\sin\theta = \frac{2}{3}$ **10.** $\cot\theta = 5$

11. $\sec\theta = 4$ **12.** $\cos\theta = \frac{1}{3}$

13. $\tan\theta = 3$ **14.** $\csc\theta = \frac{17}{4}$

15. $\cot\theta = \frac{3}{4}$ **16.** $\sin\theta = \frac{1}{2}$

In Exercises 57–62, use a calculator to evaluate each function. Round your answers to four decimal places. (Be sure the calculator is in the correct angle mode.)

57. (a) $\sin 41°$ (b) $\cos 87°$

58. (a) $\tan 18.5°$ (b) $\cot 71.5°$

59. (a) $\sec 42° 12'$ (b) $\csc 48° 7'$

60. (a) $\cos 8° 50' 25''$ (b) $\sec 8° 50' 25''$

61. (a) $\cot\frac{\pi}{16}$ (b) $\tan\frac{\pi}{8}$

62. (a) $\sec 1.54$ (b) $\cos 1.25$

Workbook Answers

1. 7.73 rad/min
2. 12.99 rad/sec
3. 1441.94 rev/min
4a. 14.29 m/sec
4b. 211.6 cm/sec
5a. 5.28 cm/sec
6. 104.72 rad/sec
5b. 8.73 cm/sec
7. 17.45 ft/sec
8. fastest - outside
9. 17222.54 mph
10. 728.29 rev/min

4.1 - Linear & Angular Speeds WS #3

1. A wheel rotates 1.23 revolutions per minute. Find the angular speed in radians of a point of the wheel.

2. Determine the angular speed in radians per second of a wheel turning 124 revolutions per minute.

3. Determine the number of revolutions per minute of the wheel rotating 151rad/s.

4. 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 AS=3.5π rad/s B) r=9.2cm AS=23 rad/s

5. Determine the linear speed of a point on a circle r units from the center that moves through an angle θ in 1 min. Express answer in cm/s.
   A) r= 72cm θ=1.4π rad B) r=1.2 m θ=250°

6. If an engine is making 1000rpm, what is the angular speed of the engine's crank shaft in radians/sec.

7. 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.

8. A large merry-go-around is four horses deep. What seat should a child choose for the fastest ride? For the slowest?

9. 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).

10. A car is moving at a speed of 65 mph, the diameter of the wheels is 2.5 ft. Find the angular speed of the wheel in radians per minute and find the number of revolutions per minute the wheels are rotating.

Feb 2-9:51 PM

Jan 14-8:54 AM