

Math 111 - Trigonometry

Practice Exam 1

Warning: This study guide is not all inclusive- there may be material on the test which is covered in the book but not here. This is simply meant to serve as a supplement to the problems in the book.

1. Find the angle of smallest positive measure co-terminal with each angle.

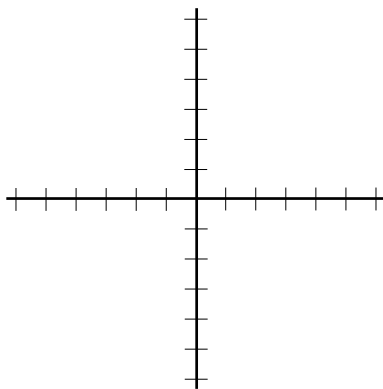
(a) $\theta = -442^\circ$
 278°

(b) $\theta = 1826^\circ$
 26°

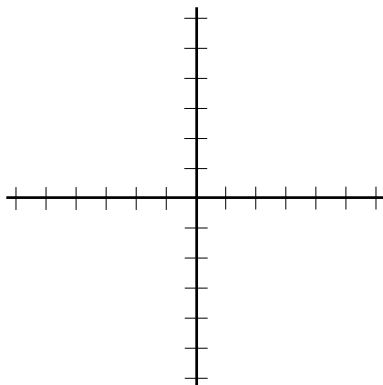
(c) $\theta = 688^\circ$
 328°

2. Sketch each angle in standard position, and give the quadrant of each angle.

(a) $\theta = -442^\circ$ - Quadrant IV



(b) $\theta = 688^\circ$ - Quadrant IV



3. What are the defining characteristics of an isosceles, obtuse triangle?
The triangle has two equal sides and one angle that is greater than 90 degrees.

4. David, A lifeguard located 20 yards from the water spots Scuba Steve in distress. Scuba Steve is 30 yards from the shore and 100 yards East of David. Suppose David runs, then swims to Scuba Steve in a direct line. Sketch the situation, and determine how far east from his original position David will enter the water.

40 yards

5. Decide whether the following statements are *possible* or *impossible*.

(a) $\sin \theta = \sqrt{2}$ - Impossible ($\sin \theta$ is bounded above by 1)

(b) $\sec \phi = \frac{3}{5}$ - Impossible ($\sec \theta$ cannot be between -1 and 1 since $\cos \theta = \frac{1}{\sec \theta}$ must be between -1 and 1)

(c) $\tan \alpha = 4,558$ - Possible

6. If $\sin(20^\circ) = a$ and $\sin(70^\circ) = b$, calculate in terms of a and b the following:

(a) $\cot(70^\circ) = \frac{a}{b}$ (note we use the cofunction identity $\sin(20^\circ) = \sin(90 - 70)^\circ = \cos(70^\circ)$)

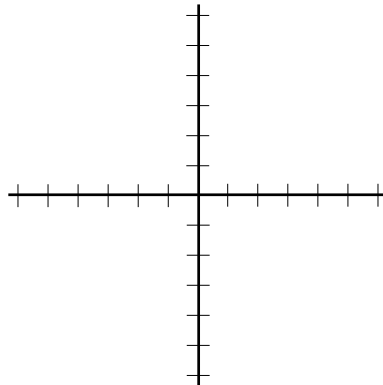
(b) $\sec(70^\circ) = \frac{1}{a}$

(c) $\csc(20^\circ) = \frac{1}{a}$

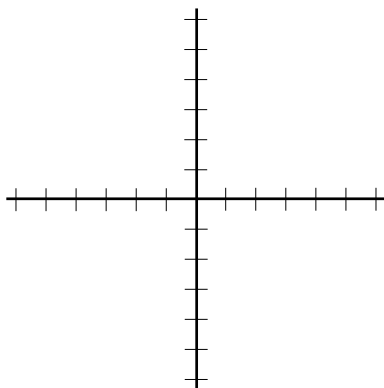
(d) $\tan(20^\circ) = \frac{a}{b}$

7. Calculate the following (hint: sketch to get an idea of which quadrant the angles lie in):

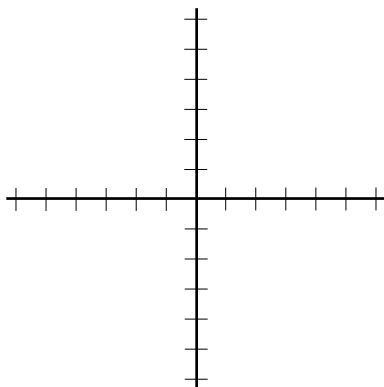
(a) $\cot(135^\circ) = -1$



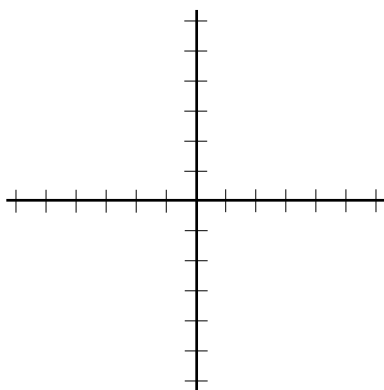
(b) $\sin(210^\circ) = -1/2$



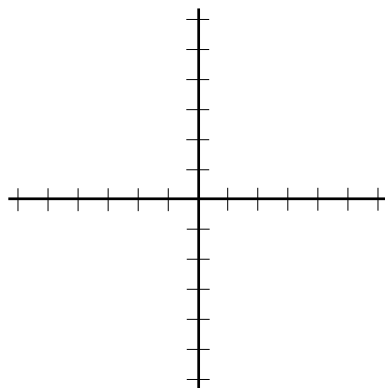
(c) $\csc(1110^\circ) = 2$



(d) $\tan(-675^\circ) = 1$



(e) $\cos(-330^\circ) = \sqrt{3}/2$



8. Simplify the following expression:

$$\cos(120^\circ) + 2 \sin^2(60^\circ) - \tan^2(30^\circ)$$

Using the double angle identity $\cos(2A) = 1 - \sin^2 A$, we have

$$\cos(120^\circ) + 1 - \cos(120^\circ) - \tan^2(30^\circ) = 1 - \tan^2(30^\circ)$$

Since $\sin 30^\circ = \frac{1}{2}$, $\cos(30^\circ) = \frac{\sqrt{3}}{2}$, we have $\tan(30^\circ) = \frac{1}{\sqrt{3}}$, so the expression is

$$1 - \tan^2(30^\circ) = 1 - \frac{1}{3} = \frac{2}{3}$$

9. An 8 foot tall fire truck is parked 10 feet next to a 45 foot tall building. There is a man on the top of the building who is stranded, and the firefighters need to extend their 40 foot long ladder, located on top of the firetruck, to the roof to save the man. Is the ladder long enough to reach him? Why or why not?

Our guess is that the author of this problem is not overly morbid and that the man does have a shot at survival. This should boil down to using Pythagorean Theorem on a triangle with legs of length 10 feet, and 37 feet. The hypotenuse is then $\sqrt{37^2 + 10^2} \approx 38.33$ feet, so the ladder can reach the top.

10. Convert the following from radians to degrees:

(a) $\pi/2 = 90^\circ$

(b) $430 = \frac{77400}{\pi}^\circ$

(c) $5\pi/7 = \frac{900}{7}^\circ$

(d) $2 = \frac{360}{\pi}^\circ$

(e) $3\pi/4 = 135^\circ$

(f) $12\pi = 2160^\circ$

(g) $1000 = \frac{180,000}{\pi}^\circ$

11. Convert the following from degrees to radians:

(a) $225^\circ = \frac{5}{4}\pi$

(b) $430^\circ = \frac{43}{18}\pi$

(c) $737^\circ = \frac{737}{180}\pi$

(d) $2\pi^\circ = \frac{\pi^2}{90}$

(e) $3\pi/4^\circ = \frac{\pi^2}{240}$

(f) $720^\circ = 4\pi$

(g) $-1000^\circ = -\frac{50}{9}\pi$

(h) $-547^\circ = \frac{547}{180}\pi$

12. Evaluate the following:

(a) $\tan(2\pi/3) = -\sqrt{3}$

(b) $\sin(3\pi/2) = -1$

(c) $\cos(-4\pi/3) = -1/2$

13. Given the following information, calculate the length of the arc from the horizontal axis to the end point of the terminal side of the ray:

(a) $\theta = \pi/4$ on a circle of radius 3
 $\frac{3}{4}\pi$ units

(b) $\theta = 3/2$ radians on the unit circle
 $\frac{3}{2}$ units

14. Using the information from part 5, calculate the area of the sector of the circle:

(a) $\theta = \pi/4$ on a circle of radius 3
 $\frac{9}{8}\pi$ units squared

(b) $\theta = 3/2$ radians on the unit circle
 $\frac{3}{4}$ units squared

15. Which of the following angles in radians are obtuse?

(a) 1 - No

(b) 2 - Yes

(c) 3 - Yes

(d) 4 - No

16. The ray determined by $2x + 3y = 0$, with $x \leq 0$, is the terminal ray of an angle θ in standard position. Find the exact value of $\sin \theta$.

$$\sin \theta = 2/\sqrt{13}$$

17. A, B are angles in standard position which have the same reference angle. Does $\sin A = \sin B$?

No - 30° and -30° both have the same reference angle of 30° , but

$$\sin(30^\circ) = \frac{1}{2} \neq \sin(-30^\circ) = -\frac{1}{2}$$