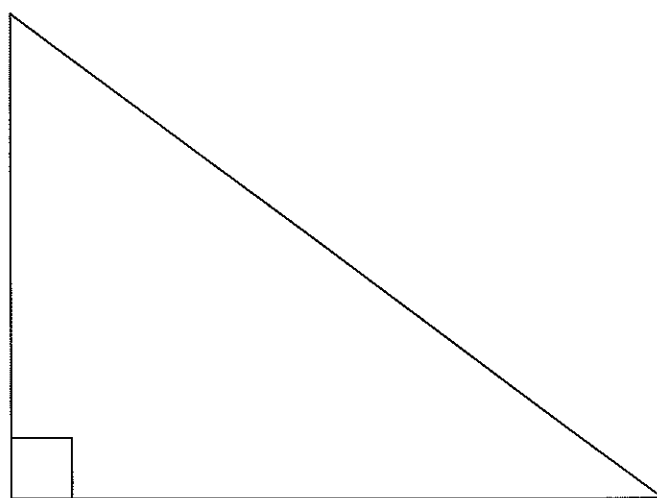


# Advanced Algebra

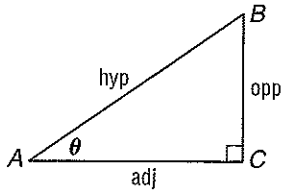
## Unit 9 Practice: Trigonometry



# 13-1 Study Guide and Intervention

## Right Triangle Trigonometry

### Trigonometric Values

<p><b>Trigonometric Functions</b></p> 	<p>If <math>\theta</math> is the measure of an acute angle of a right triangle, <i>opp</i> is the measure of the leg opposite <math>\theta</math>, <i>adj</i> is the measure of the leg adjacent to <math>\theta</math>, and <i>hyp</i> is the measure of the hypotenuse, then the following are true.</p> $\sin \theta = \frac{\text{opp}}{\text{hyp}} \quad \cos \theta = \frac{\text{adj}}{\text{hyp}} \quad \tan \theta = \frac{\text{opp}}{\text{adj}}$ $\csc \theta = \frac{\text{hyp}}{\text{opp}} \quad \sec \theta = \frac{\text{hyp}}{\text{adj}} \quad \cot \theta = \frac{\text{adj}}{\text{opp}}$
---	--

**Example** Find the values of the six trigonometric functions for angle  $\theta$ .

Use the Pythagorean Theorem to find  $x$ , the measure of the leg opposite  $\theta$ .

$$x^2 + 7^2 = 9^2$$

Pythagorean Theorem

$$x^2 + 49 = 81$$

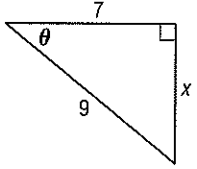
Simplify.

$$x^2 = 32$$

Subtract 49 from each side.

$$x = \sqrt{32} \text{ or } 4\sqrt{2}$$

Take the square root of each side.

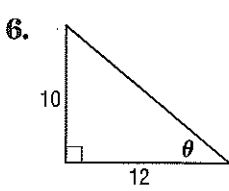
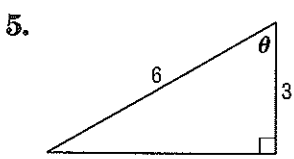
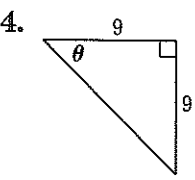
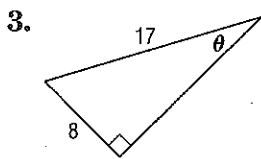
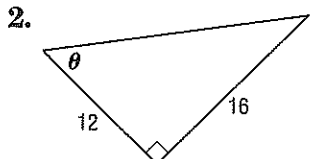
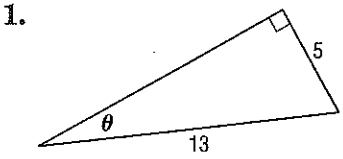


Use  $\text{opp} = 4\sqrt{2}$ ,  $\text{adj} = 7$ , and  $\text{hyp} = 9$  to write each trigonometric ratio.

$$\sin \theta = \frac{4\sqrt{2}}{9} \quad \cos \theta = \frac{7}{9} \quad \tan \theta = \frac{4\sqrt{2}}{7} \quad \csc \theta = \frac{9\sqrt{2}}{8} \quad \sec \theta = \frac{9}{7} \quad \cot \theta = \frac{7\sqrt{2}}{8}$$

### Exercises

Find the values of the six trigonometric functions for angle  $\theta$ .

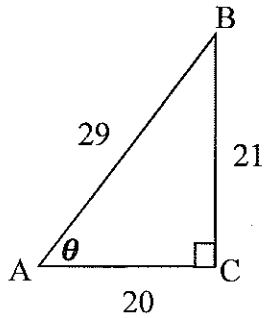


Lesson 13-1

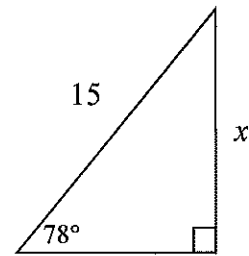
**P19 – Finding Sides and Angles**  
*Advanced Algebra*

Name: \_\_\_\_\_  
Period: \_\_\_\_ Date: \_\_\_\_\_

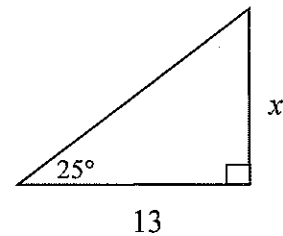
1. Find the values of the six trigonometric functions for angle  $\theta$ .



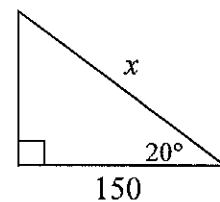
2. Find the length of the missing side to the nearest tenth.



3. Find the value of  $x$  to the nearest tenth.



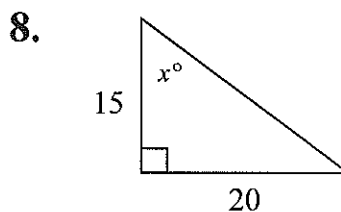
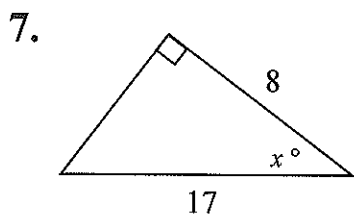
4. Find the value of  $x$ . Round the answer to the nearest tenth.



5. If your distance from the base of the tower is 20 m and the angle of elevation is  $40^\circ$ , find the height of the tower.

6. A ramp has an angle of elevation of  $20^\circ$  and a vertical height of 1.8 m. What is the length, in meters, of the ramp?

**Find the missing angle measure  $x$ . Round to the nearest degree.**



**P20 - Trigonometry Word Problems**  
*Advanced Algebra*

Name: \_\_\_\_\_  
Period: \_\_\_\_ Date: \_\_\_\_\_

*Draw a picture, write an equation using sine, cosine, or tangent, and then solve the problem.*

1. A kite is flown with 120 m of string. The angle of elevation of the kite is  $57^\circ$ . How high is the kite?

2. A flagpole casts a shadow 16.7 m long. The angle of elevation from the ground to the top of the pole is  $17^\circ$ . How tall is the flagpole?

3. Donna wonders the height of her school building. She measures out 30 m from the base of the building. From there she finds that the angle of depression from the top of the building is  $53^\circ$ . How tall is Donna's school building?
4. Ryan was skiing at Winter Park in Colorado last winter. He was at the top of Eagle Peak. He measured the angle of depression to the bottom of the run to be  $18^\circ$ . He read that the actual length of the run is 2675 feet. What is the change in altitude to the bottom of the run?

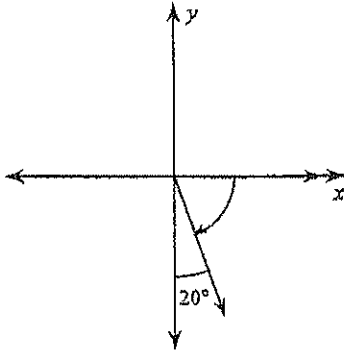
# P21 - Assignment

DATE: \_\_\_\_\_

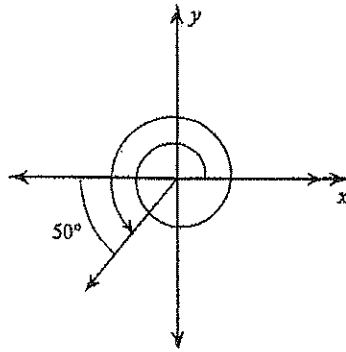
- Target 9.B: Draw an angle of rotation, find its coterminal angles, and determine the quadrant in which it lands.

Find the measure of each angle.

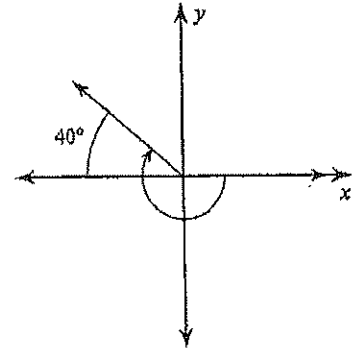
1.



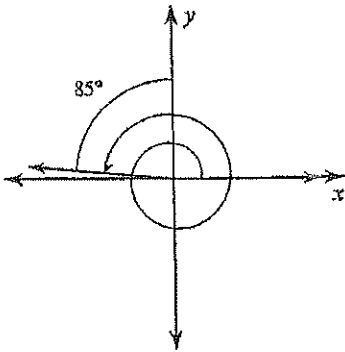
2.



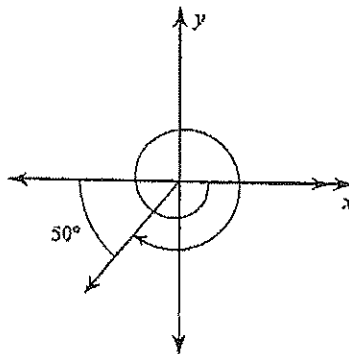
3.



4.

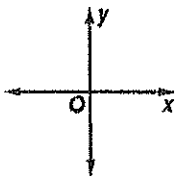


5.

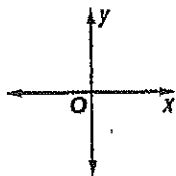


Draw an angle with the given measure in standard position.

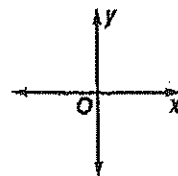
6.  $135^\circ$



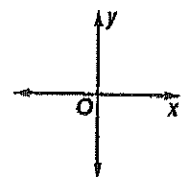
7.  $210^\circ$



8.  $305^\circ$



9.  $-450^\circ$



10. State the quadrant in which the terminal side of  $\theta = 105^\circ$  will land.
11. State the quadrant in which the terminal side of  $\theta = -70^\circ$  will land.
12. Find one angle with positive measure and one angle with negative measure coterminal with  $120^\circ$ .
13. Find one angle with positive measure and one angle with negative measure coterminal with  $225^\circ$ .

**Target 9.C:** Understand how to move between radian measure and degree measure.

- Convert to degree measure:

14.  $\frac{4\pi}{3}$

15.  $-\frac{\pi}{4}$

16.  $\frac{11\pi}{6}$

17.  $5\pi$

- Convert to radian measure:

18.  $315^\circ$

19.  $-90^\circ$

20.  $120^\circ$

21.  $405^\circ$



**Coterminal Angles** When two angles in standard position have the same terminal sides, they are called **coterminal angles**. You can find an angle that is coterminal to a given angle by adding or subtracting a multiple of  $360^\circ$ . In radian measure, a coterminal angle is found by adding or subtracting a multiple of  $2\pi$ .

Ex 2: Find one angle with positive measure and one with negative measure coterminal with each angle.

In degrees

a.  $250^\circ$

A positive angle is  $250^\circ + 360^\circ$  or  $610^\circ$ .

A negative angle is  $250^\circ - 360^\circ$  or  $-110^\circ$ .

In radians

b.  $\frac{5\pi}{8}$

A positive angle is  $\frac{5\pi}{8} + 2\pi$  or  $\frac{21\pi}{8}$ .

A negative angle is  $\frac{5\pi}{8} - 2\pi$  or  $-\frac{11\pi}{8}$ .

Find one angle with a positive measure and one angle with a negative measure coterminal with each angle.

1.  $65^\circ$

2.  $-75^\circ$

3.  $230^\circ$

4.  $420^\circ$

5.  $340^\circ$

6.  $-130^\circ$

7.  $-290^\circ$

8.  $690^\circ$

9.  $-420^\circ$

10.  $\frac{\pi}{9}$

11.  $\frac{3\pi}{8}$

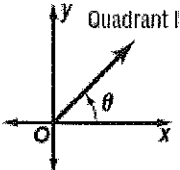
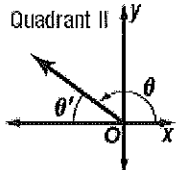
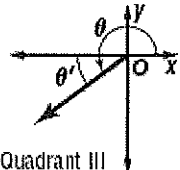
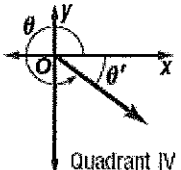
12.  $\frac{6\pi}{5}$

13.  $\frac{-7\pi}{4}$

14.  $\frac{15\pi}{4}$

15.  $\frac{-13\pi}{6}$

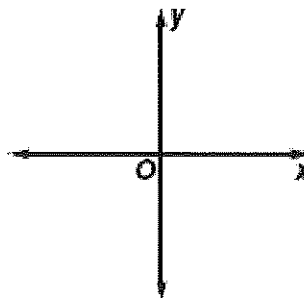
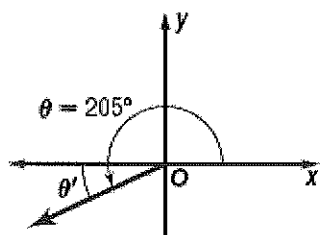
**Reference Angles** The acute angle that the terminal side of an angle makes with the x-axis is called its reference angle. The reference angle is used in finding trigonometric ratios of angles.

Reference Angle Rule	 <p>Quadrant I</p> $\theta' = \theta$	 <p>Quadrant II</p> $\theta' = 180^\circ - \theta$ $(\theta' = \pi - \theta)$	 <p>Quadrant III</p> $\theta' = \theta - 180^\circ$ $(\theta' = \theta - \pi)$	 <p>Quadrant IV</p> $\theta' = 360^\circ - \theta$ $(\theta' = 2\pi - \theta)$
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**Ex 3:** Sketch an angle of measure  $205^\circ$ . Then find its reference angle.

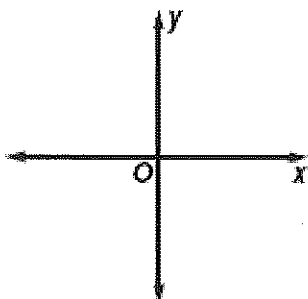
Because the terminal side of  $205^\circ$  lies in Quadrant III, the reference angle  $\theta'$  is  $205^\circ - 180^\circ$  or  $25^\circ$ .

16.  $\frac{7\pi}{6}$

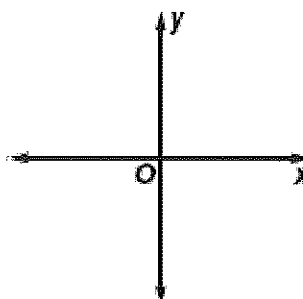


Sketch each angle, then find its reference angle.

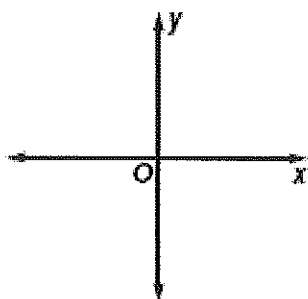
17.  $120^\circ$



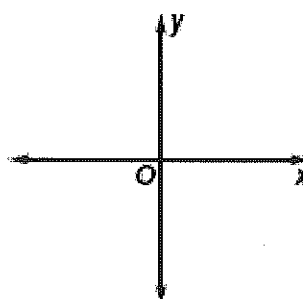
18.  $200^\circ$



19.  $\frac{5\pi}{3}$



20.  $\frac{3\pi}{4}$

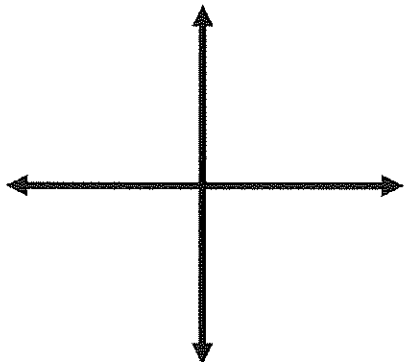


**P23 - Trig Functions of General Angles Given a Point**  
Advanced Algebra

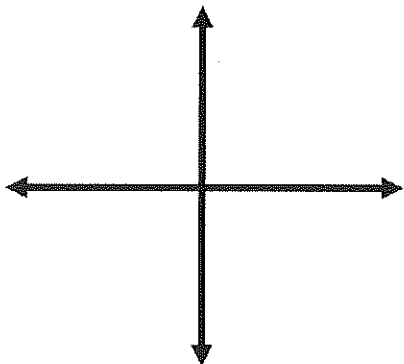
Name: \_\_\_\_\_  
Period: \_\_\_\_\_ Date: \_\_\_\_\_

*Find the exact values of the six trigonometric functions of  $\theta$  if the terminal side of  $\theta$  in standard position contains the given point.*

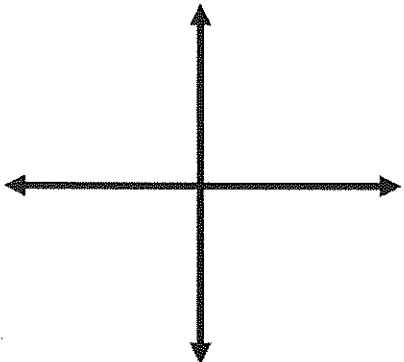
1. (5, 12)



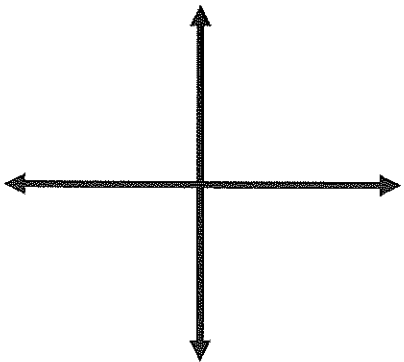
2. (-3, 4)



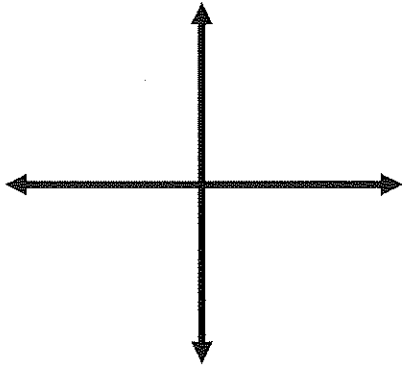
3. (8, -15)



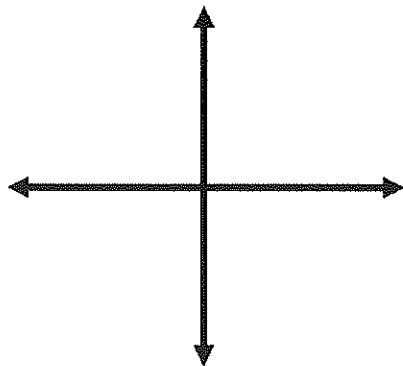
4. (-4, 3)



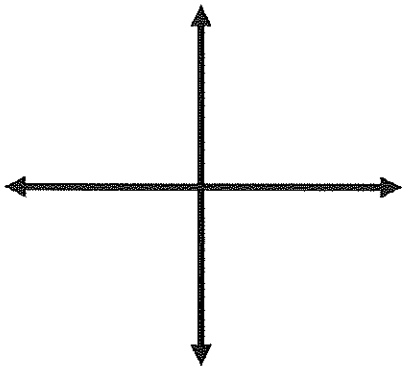
5.  $(-9, 40)$



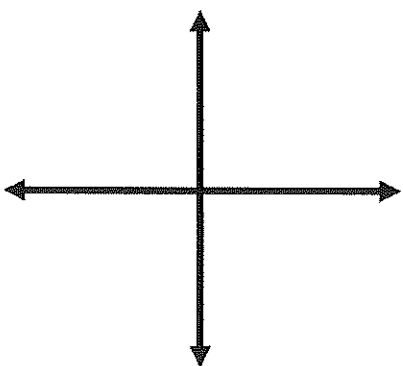
6.  $(6, 8)$



7.  $(21, -20)$



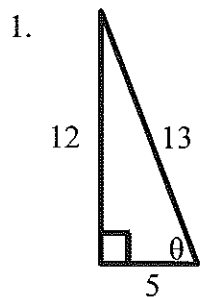
8.  $(-16, 30)$



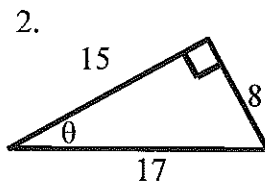
**Unit 9 Review - Trigonometry**  
**Advanced Algebra**

Name: \_\_\_\_\_  
 Period: \_\_\_\_\_ Date: \_\_\_\_\_

*Write the six trigonometric functions for angle  $\theta$ .*

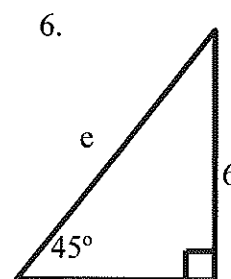
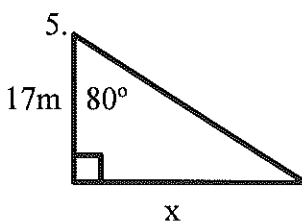
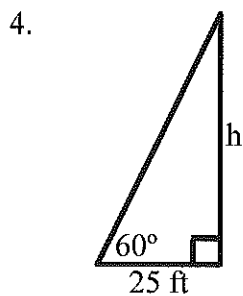
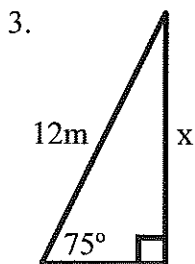


$\sin \theta =$                        $\csc \theta =$   
 $\cos \theta =$                        $\sec \theta =$   
 $\tan \theta =$                        $\cot \theta =$



$\sin \theta =$                        $\csc \theta =$   
 $\cos \theta =$                        $\sec \theta =$   
 $\tan \theta =$                        $\cot \theta =$

*Solve for the variable. The final answer may be written in simplest radical form, or rounded to the nearest hundredth (two decimal places).*



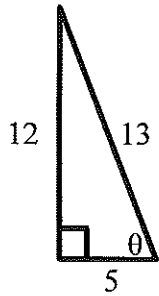
*Use the space below to create a diagram and solve the word problems. Round your answers to two decimal places.*

7. The height of the kite is 25 feet. The string to the kite makes an angle of  $75^\circ$  to the ground. How long is the string to the kite?

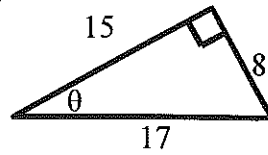
8. The height of the kite is 37 feet. The string to the kite makes an angle of  $80^\circ$  to the ground. How long is the string to the kite?

Determine the measure of the indicated angle in each of the following diagrams.

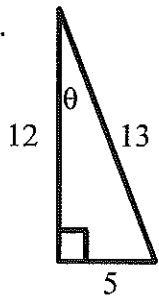
9.



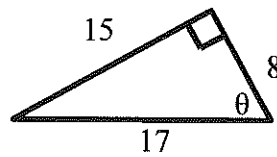
10.



11.



12.



Solve each function. Round your answers to the nearest hundredth (two decimal places).

13.  $\cos^{-1}(0.63) =$

14.  $\sin^{-1}(0.91) =$

15.  $\sin \theta = 0.8$

16.  $\tan \theta = 0.6$

Change the radian measures to degree measures.

17.  $\frac{3\pi}{4}$

18.  $\frac{-5\pi}{3}$

19.  $\frac{6\pi}{5}$

20.  $\frac{-3\pi}{20}$

21.  $\frac{14\pi}{9}$

Change the degree measures to radian measures.

22.  $-270^\circ$

23.  $340^\circ$

24.  $-420^\circ$

25.  $145^\circ$

26.  $-72^\circ$

Find three angles (positive or negative) that are co-terminal with each angle.

27.  $160^\circ$

28.  $-25^\circ$

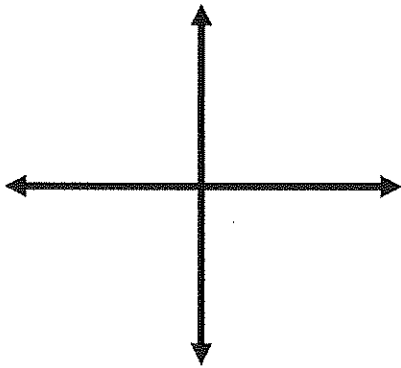
29.  $375^\circ$

30.  $-422^\circ$

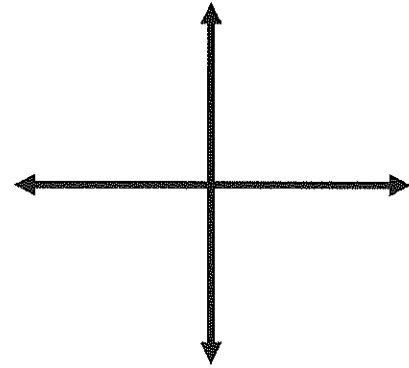
31.  $11^\circ$

Sketch the given angle and determine the quadrant in which it lands. Then, find the measure of its reference angle.

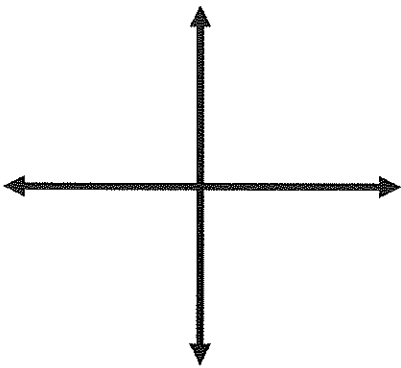
32.  $-215^\circ$



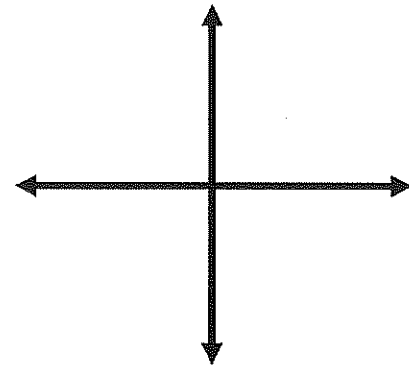
33.  $73^\circ$



34.  $-164^\circ$

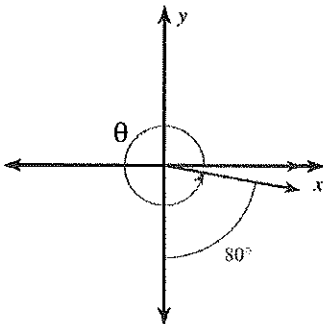


35.  $418^\circ$

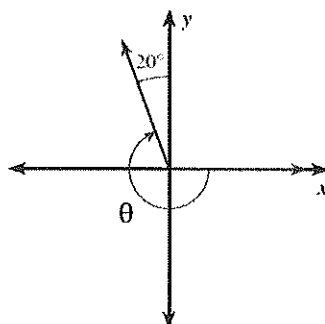


Find the measure of the indicated angle,  $\theta$ .

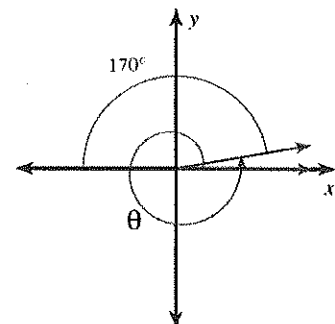
36.



37.



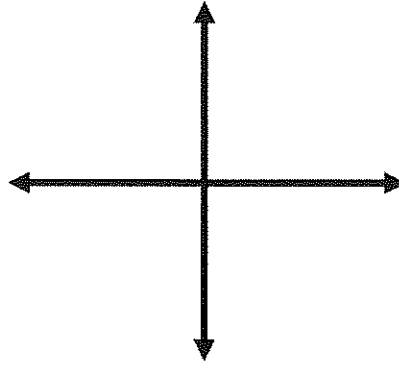
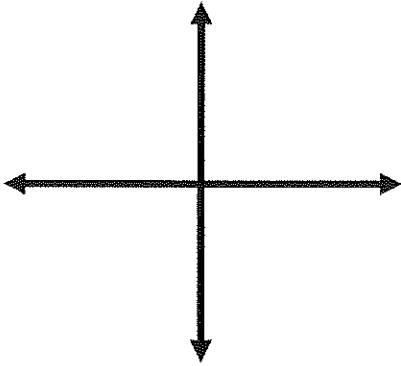
38.



*Find the exact values of the six trigonometric functions, given the terminal side of  $\theta$  contains the given point.*

39.  $(-3, -4)$

40.  $(7, -24)$



$\sin \theta =$                    $\csc \theta =$

$\sin \theta =$                    $\csc \theta =$

$\cos \theta =$                    $\sec \theta =$

$\cos \theta =$                    $\sec \theta =$

$\tan \theta =$                    $\cot \theta =$

$\tan \theta =$                    $\cot \theta =$