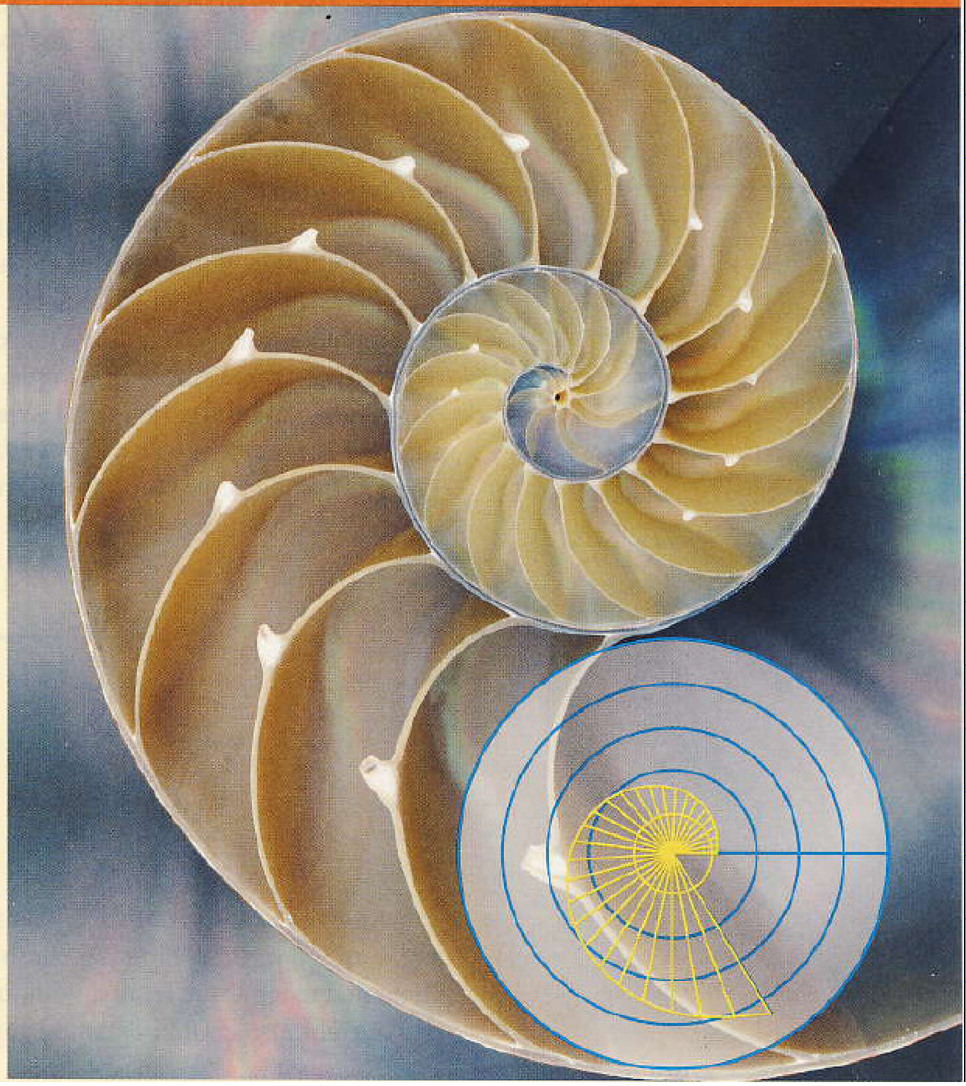
1 Trigonometric Functions

BRING YOUR TRIG BOOK FOR A COUPLE QUARTERS!



1.1 Angles

GEOMETRY REVIEW

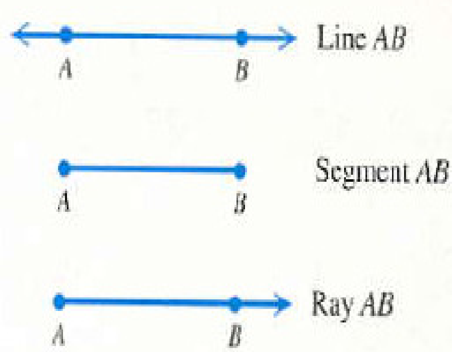
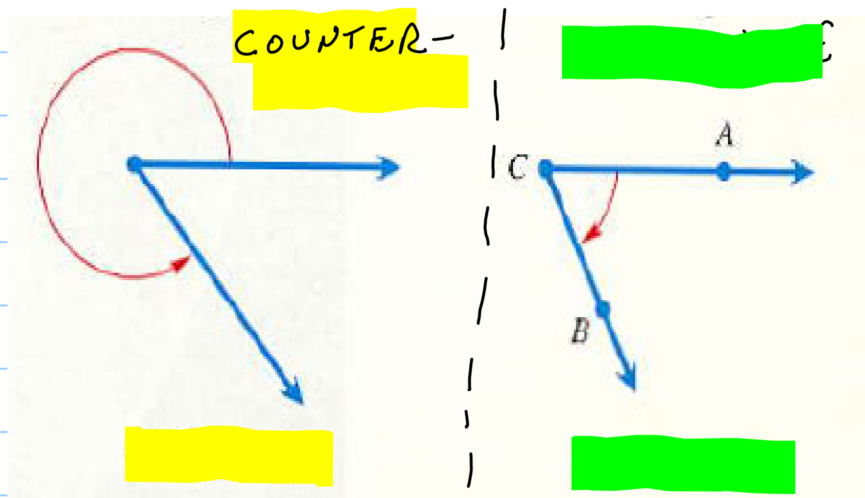
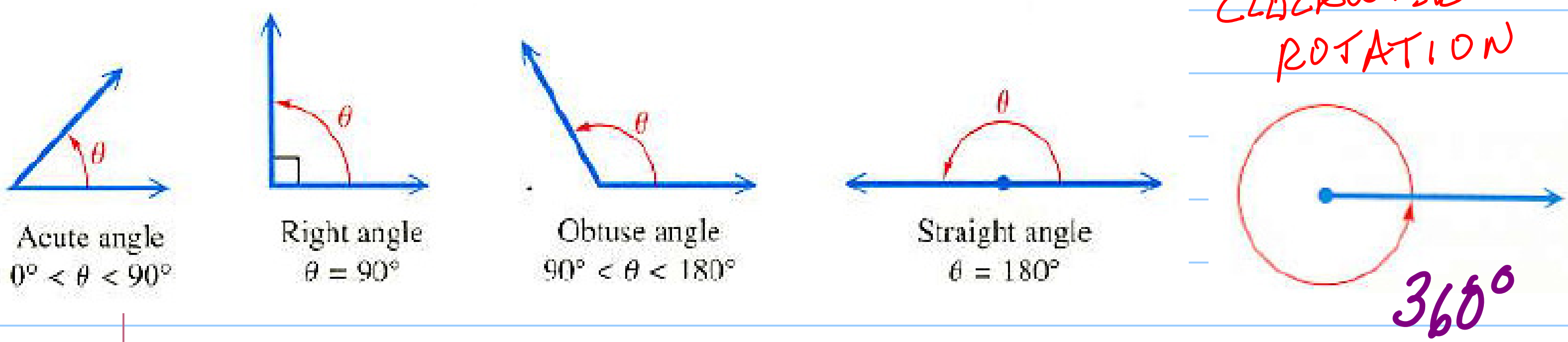


Figure 1



In Figure 5, we use the **Greek letter θ (theta)*** to name each angle.

1 COUNTER-CLOCKWISE ROTATION



sum of the measures of two positive angles

DEGREES CAN BE BROKEN DOWN:

One **minute,** written $1'$, is $\frac{1}{60}$ of a degree.

$$1' = \frac{1}{60}^{\circ} \quad \text{or}$$

One , $1''$, is $\frac{1}{60}$ of a minute.

$$1'' = \frac{1}{60}' = \frac{1}{3600}^{\circ} \quad \text{or}$$

$3600'' = 1°$

(a) Convert $74°\,8'\,14''$ to decimal degrees to the nearest thousandth. (b) Convert $34.817°$ to degrees, minutes, and seconds.

(a) $74°\,8'\,14'' = 74° + \frac{8°}{60} + \frac{14°}{3600}$

$\approx$

$\approx \boxed{74.137°}$

(b) $34.$ $= 34° + .817(60') + .02(60'')$

$= \quad + 49.02 + 1.2$

$= \boxed{34°\ 49'\ 1.2''}$

78°8'14"

34.817▸DMS

Find (a) the complement and (b) the supplement of an angle with the given measure. See Examples 1 and 3.

11. 20° 10′ 30″

20°10'30"

20.175

$$\begin{array}{rrr} \cancel{90^\circ}\ 89 & \cancel{60}\ 59' & 60'' \\ -\ 20^\circ & 10' & 30'' \\ \hline \end{array}$$

$90 - 20° 10' 30''$

Com $\boxed{69° 49' 30''}$

$180 - 20° 10' 30'' = 159° 49° 30''$

Perform each calculation. See Example 3.

37. 90° − 51° 28′

GRADE SCHOOL

BORROW 1° →

$$\begin{array}{rr} 89^\circ & 60' \\ -\ 51^\circ & 28' \\ \hline 38^\circ & 32'' \end{array}$$

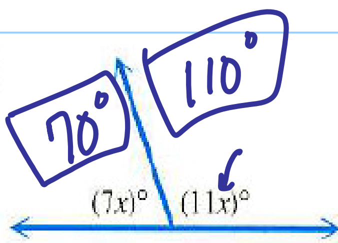
42. 55° 30′ + 12° 44′ − 8° 15′

CALCULATOR!

$$\begin{array}{rr} 55^\circ & 30' \\ +\ 12^\circ & 44' \\ \hline 67^\circ & 74' \\ -\ 8^\circ & 15' \\ \hline \end{array}$$

Find the measure of each unknown angle in Exe[illegible]mple 2.

13.



$7x + 11x = 180$

$18x = 180$

$x = 10$

21. complementary angles with measures $\boxed{9x + 6}$ and $\boxed{3x}$ degrees

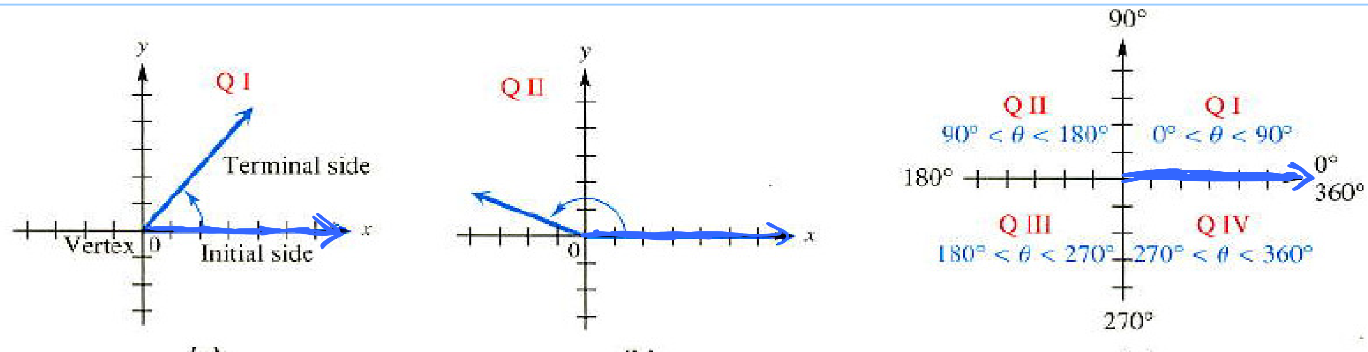
$9x + 6 + 3x = 90$

$12x = 84$

$x = 7$

$\boxed{69°, 21°}$

An angle is in **standard position** if its and its The angles in Figures 8(a) and 8(b) are in standard position. An angle in standard position is said to lie in the quadrant in which its terminal side lies. An acute angle is in quadrant I (Figure 8(a)) and an obtuse angle is in quadrant II (Figure 8(b)). Figure 8(c) shows ranges of angle measures for each quadrant when $0° < \theta < 360°$.



(a) (b) (c)

Angles in standard position whose terminal sides lie on the or such as angles with measures , , , and so on, are called

Coterminal Angles

same initial side and the same terminal side, *their measures differ by a multiple of 360°.*

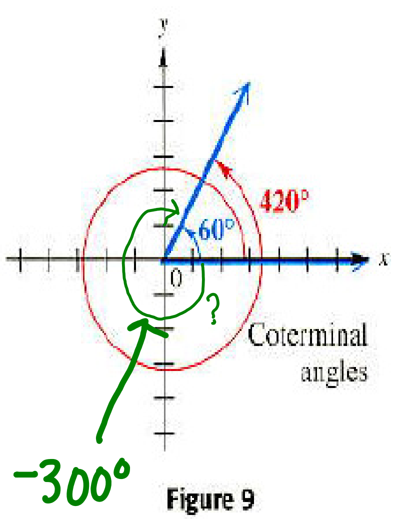


Figure 9

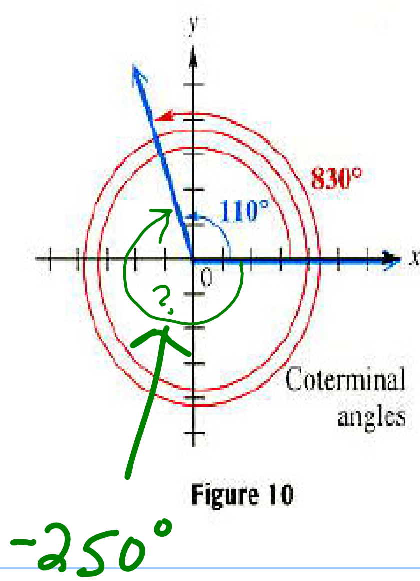


Figure 10

Find the angle of least positive measure (not equal to the given measure) coterminal with each angle. See Example 5.

84. 1000°   280°

−360   360   ~~−80°~~

640   280°

Give two positive and two negative angles that are coterminal with the given quadrantal angle.

89. 90°   90°; 450°, 810°

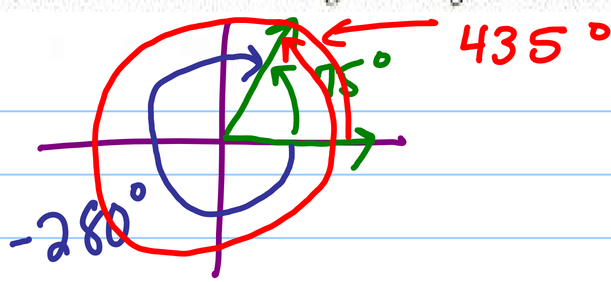
−270°, −630°

Give an expression that generates all angles coterminal with each angle. Let n represent any integer.

97. −90° $\boxed{-90 + 360n}$

Concept Check Sketch each angle in standard position. Draw an arrow representing the correct amount of rotation. Find the measure of two other angles, one positive and one negative, that are coterminal with the given angle. Give the quadrant of each angle, if applicable.

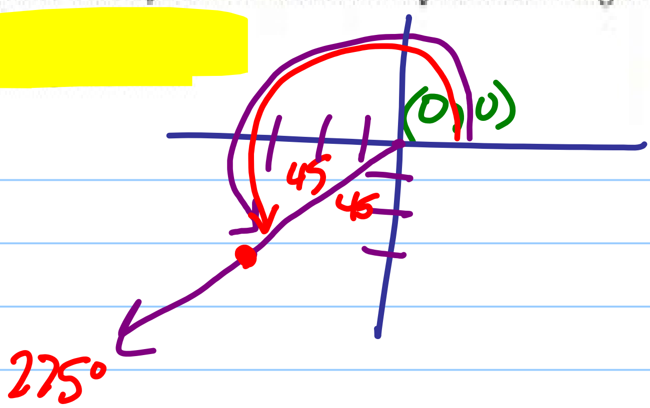
103. 75°



I

Concept Check Locate each point in a coordinate system. Draw a ray from the origin through the given point. Indicate with an arrow the angle in standard position having least positive measure. Then find the distance r from the origin to the point, using the distance formu[illegible]

115. (−3, −3)



$d = \sqrt{(x_1-x_2)^2 + (y_1-y_2)^2}$

$\sqrt{(0+3)^2 + (0+3)^2}$

$\sqrt{9+9}$

$\sqrt{18} \approx 3\sqrt{2}$

Revolutions of a Windmill: [redacted]

a) How many revolutions does it make per second?

$$\frac{180\text{ rev}}{1\text{ }\cancel{\text{min}}} \cdot \frac{1\text{ }\cancel{\text{min}}}{60\text{ sec}} = \frac{3\text{ rev}}{1\text{ sec}}$$

b) Through how many degrees does a point on the edge of the windmill move in 1 second? in 2 seconds

$$\frac{3\text{ }\cancel{\text{rev}}}{1\text{ sec}} \cdot \frac{360^\circ}{1\text{ }\cancel{\text{rev}}} = \frac{1080^\circ}{1\text{ sec}}$$

$$\frac{1080^\circ}{1\text{ sec}} \times 2 = 2160^\circ$$