

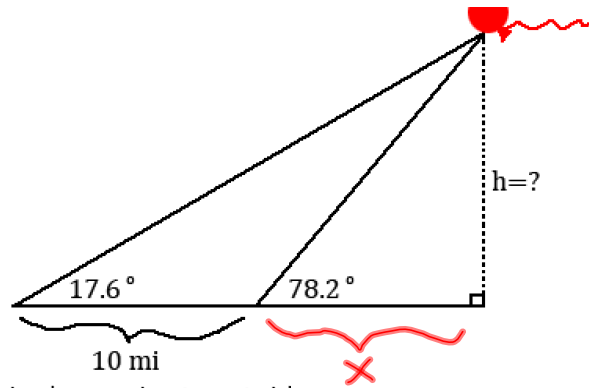
5.2 #24 - The balloon problem:

$$\tan 78.2^\circ = \frac{h}{x} \quad \tan 17.6^\circ = \frac{h}{x+10}$$

$$x \tan 78.2^\circ = h$$

Substitution yields:

$$x = \frac{h}{\tan 78.2^\circ} \quad \tan 17.6^\circ = \frac{h}{\frac{h}{\tan 78.2^\circ} + 10}$$



When confronted by an equation involving fractions, it is always nice to get rid of the fractions by multiplying both sides by the least common denominator.

$$\left(\frac{h}{\tan 78.2^\circ} + 10\right) \cdot \tan 17.6^\circ = \frac{h}{\frac{h}{\tan 78.2^\circ} + 10} \cdot \left(\frac{h}{\tan 78.2^\circ} + 10\right)$$

Distribution yields: $h \frac{\tan 17.6^\circ}{\tan 78.2^\circ} + 10 \tan 17.6^\circ = h$

When more than one instance of your variable appears, try to get all instances of the variable on one side and everything else on the other side.

$$10 \tan 17.6^\circ = h - \frac{h \tan 17.6^\circ}{\tan 78.2^\circ}$$

To get h by itself, factor and then divide.

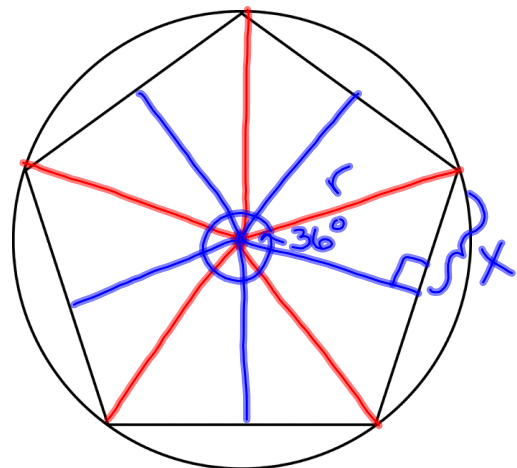
$$10 \tan 17.6^\circ = h \left(1 - \frac{\tan 17.6^\circ}{\tan 78.2^\circ}\right)$$

$$h = \frac{10 \tan 17.6^\circ}{1 - \frac{\tan 17.6^\circ}{\tan 78.2^\circ}} \approx 3.4 \text{ miles}$$

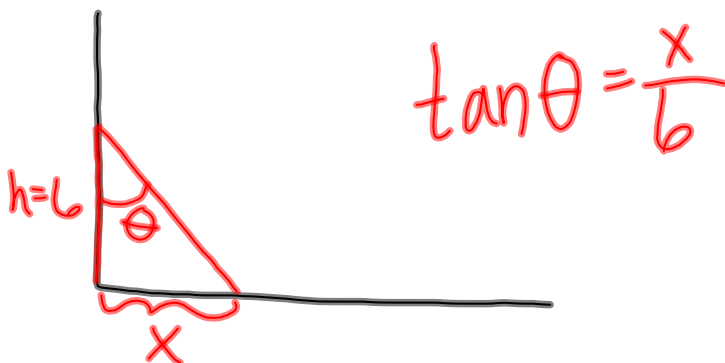
5.2 #23 - Inscribed Pentagon

$$\sin 36^\circ = \frac{x}{r}$$

$$\text{perimeter} = 10x$$



#19 - ease 1



5.2 #30 - Lightning Detection: A detector at point Q is situated 15 mi west of a central fire station at point R. The bearing from Q to where lightning hits due south of R is $S37.6^\circ E$. How far is the hit from point R?

37.6° east of south

$$\tan 37.6^\circ = \frac{15}{X}$$

$$X = \frac{15}{\tan 37.6^\circ} \text{ mi} \approx 19.5 \text{ mi}$$

An airplane traveling 240 miles per hour is descending at an angle of 30° . Through how many vertical miles will the plane descend in 4 minutes?

$\sin 30^\circ = \frac{X}{16}$

$X = 16 \sin 30^\circ$

$= 16 \cdot \frac{1}{2}$

$= 8 \text{ mi}$

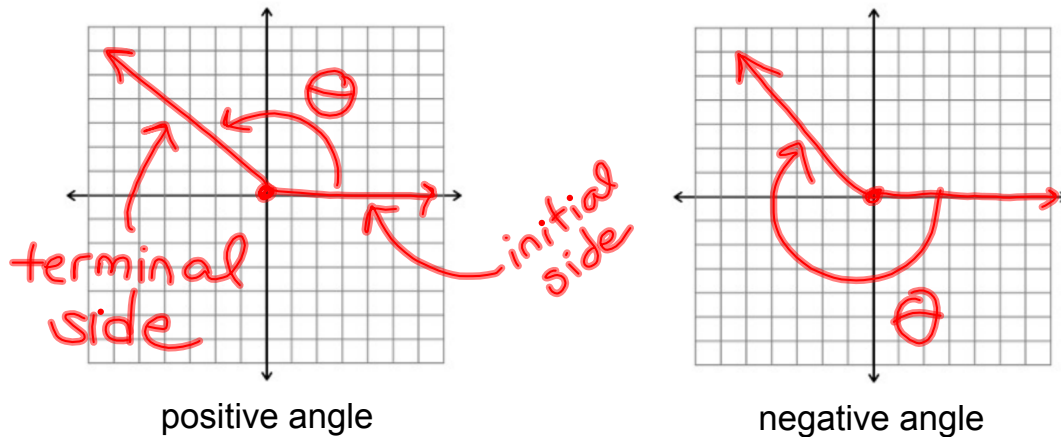
$= 16 \text{ mi}$

distance = rate \times time

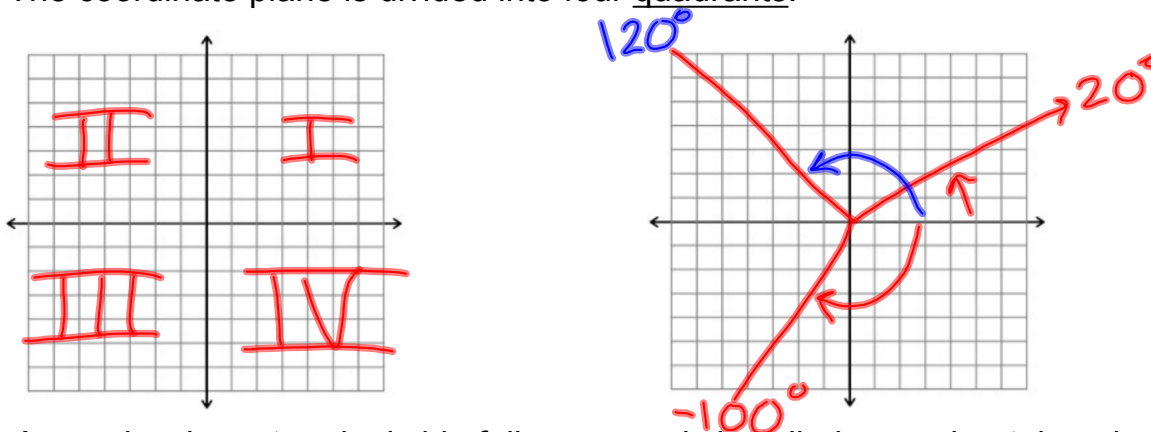
$$= \frac{240 \text{ mi}}{\text{hour}} \cdot \frac{4 \text{ min}}{1} \cdot \frac{1 \text{ hr}}{60 \text{ min}} = 16 \text{ mi}$$

5.3 Trigonometric Functions of Any Angle

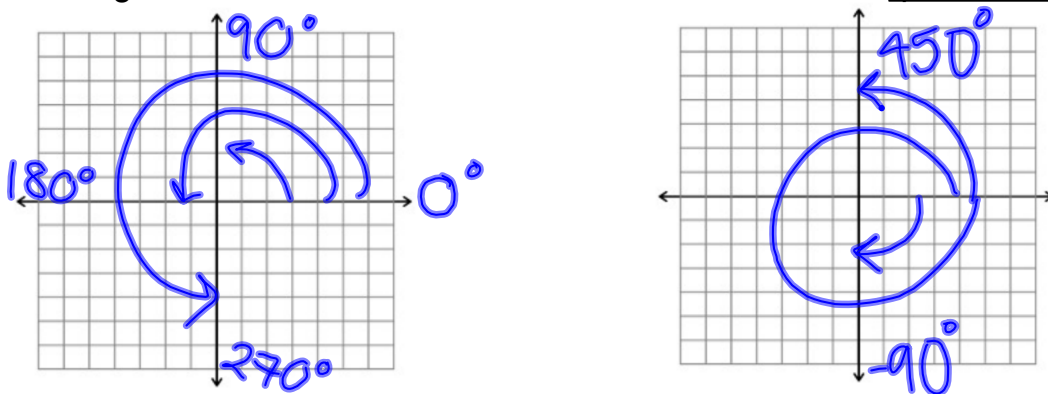
An angle in standard position has its vertex at the origin and initial side on the positive x-axis, and is measured counter-clockwise.



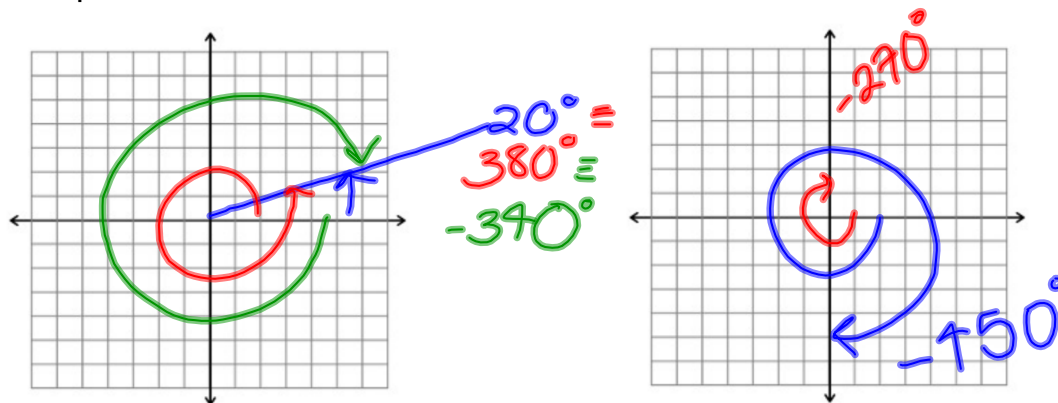
The coordinate plane is divided into four quadrants.



An angle whose terminal side falls on an axis is called a quadrantal angle.



Two angles sharing a terminal side are called coterminal and differ by integer multiples of 360° .



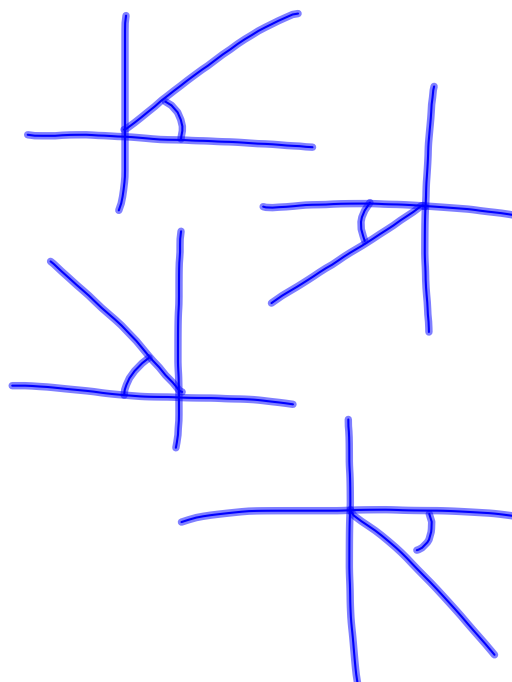
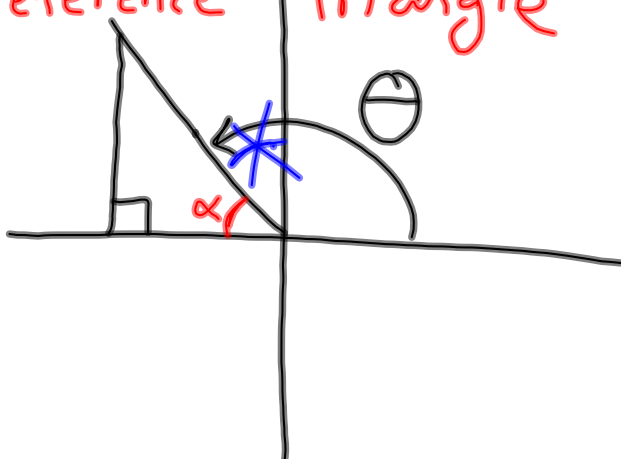
Find two positive and two negative angles that are coterminal with 89° .

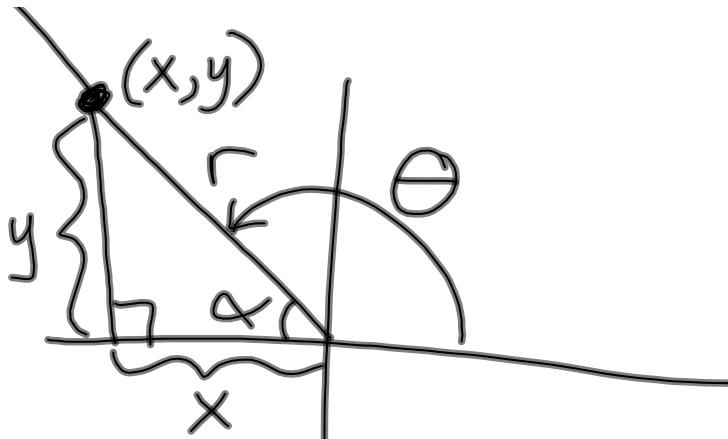
$$89^\circ + 360^\circ = 449^\circ + 360^\circ = 809^\circ$$

$$89^\circ - 360^\circ = -271^\circ - 360^\circ = -631^\circ$$

For an angle in standard position, the reference angle is the acute angle between the terminal side of the angle and the x-axis.

reference triangle

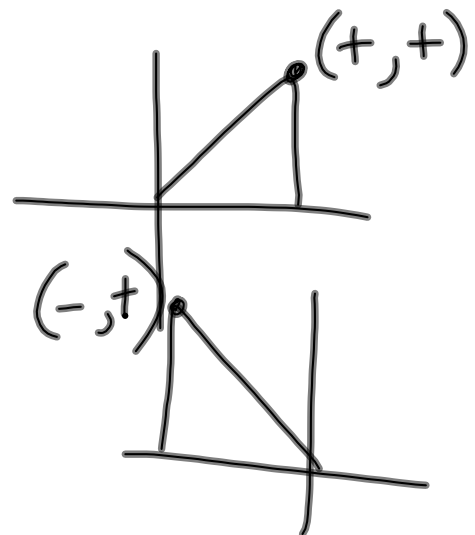




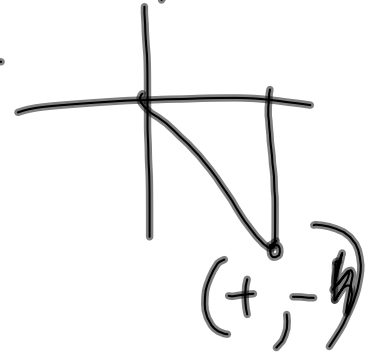
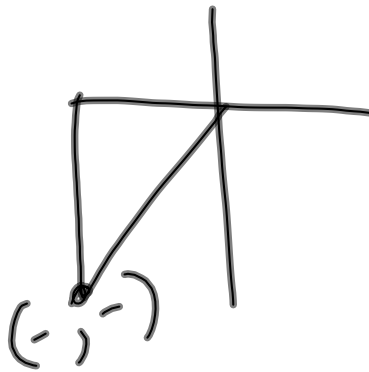
$$\sin \theta = \frac{y}{r}$$

$$\cos \theta = \frac{x}{r}$$

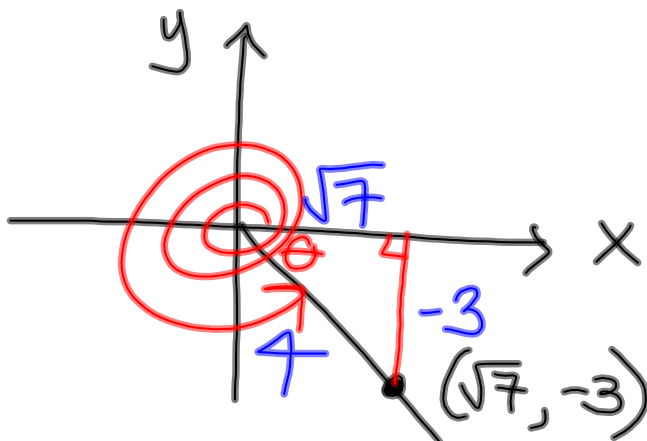
$$\tan \theta = \frac{y}{x}$$



$(-, +)$



5.3 #26



$$\sec \theta = \frac{4}{\sqrt{7}}$$

$$\tan \theta = -\frac{3}{\sqrt{7}}$$

$$\sin \theta = \frac{-3}{4}$$

$$r^2 = (\sqrt{7})^2 + (-3)^2$$

$$= 7 + 9 = 16$$

$$r = 4$$

5.2 # 31,

5.3 # 1-27 odd