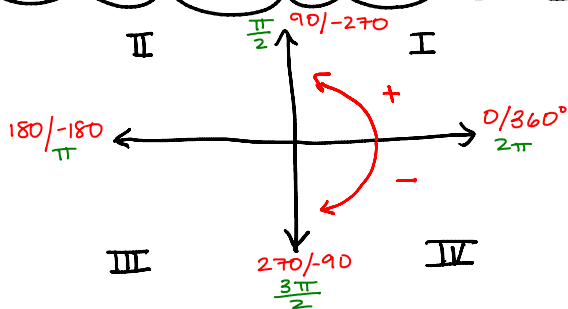
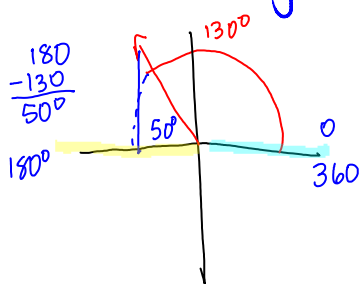


Coterminal and Reference Angles



Reference Angles - distance from the closest horizontal axis

- always positive
- if terminal side is in ..

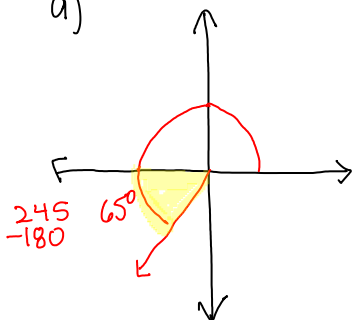


Quadrant I - distance to 0
 Quadrant II/III - distance from $180/\pi$
 Quadrant IV - distance from $360/2\pi$

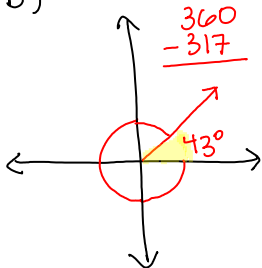
- always between 0 and 90° or 0 and $\frac{\pi}{2}$

- 1) Draw angle in standard position.
- 2) Find reference angle.

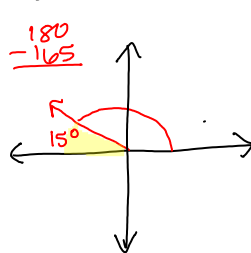
a) 245°



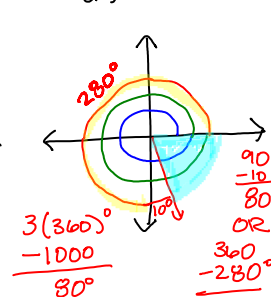
b) -317°



c) 165°



d) 1000°



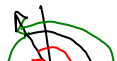
If in radians, convert to degrees, graph, then put back in degrees.

Coterminal Angles

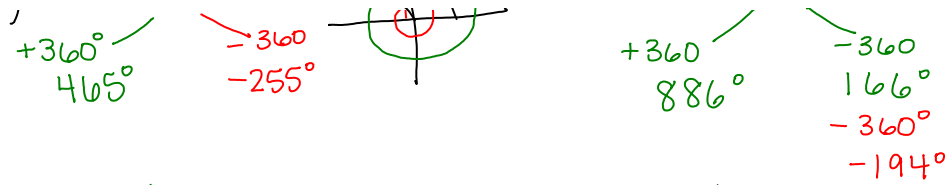
- angles with different measures whose terminal side is in the same position
- $\pm 360^\circ$ or 2π
- sum of coterminal angles are multiples of 360° or 2π

One positive, one negative coterminal angle

a) 105°



b) 526°



Find the coterminal angle between 0 and 360° for 1560°
 $1560 - 360 = 1200 - 360 = 840 - 360 = 480 = \boxed{120^\circ}$

One positive, one negative

c) $\frac{2\pi}{3}$
 $+2\pi$ leads to $(\frac{2}{3}) + 2 = \frac{8\pi}{3}$
 -2π leads to $(\frac{2}{3}) - 2 = -\frac{4\pi}{3}$

d) $\frac{11\pi}{4}$
 $+2\pi$ leads to $\frac{19\pi}{4}$
 -2π leads to $\frac{3\pi}{4}$
 -2π leads to $-\frac{5\pi}{4}$

Coterminal angle between 0 and 2π of $\frac{31\pi}{6}$.
 $\frac{31}{6} - 2 = \frac{19}{6}$ (3.1667)
 $\frac{19}{6} - 2 = \frac{7\pi}{6}$ (1.166...)