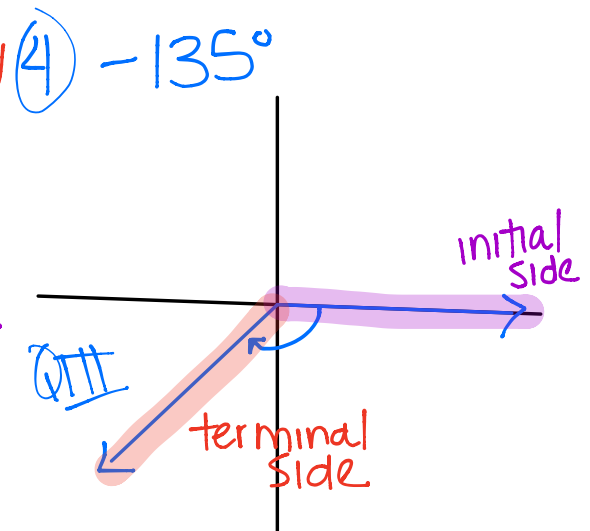
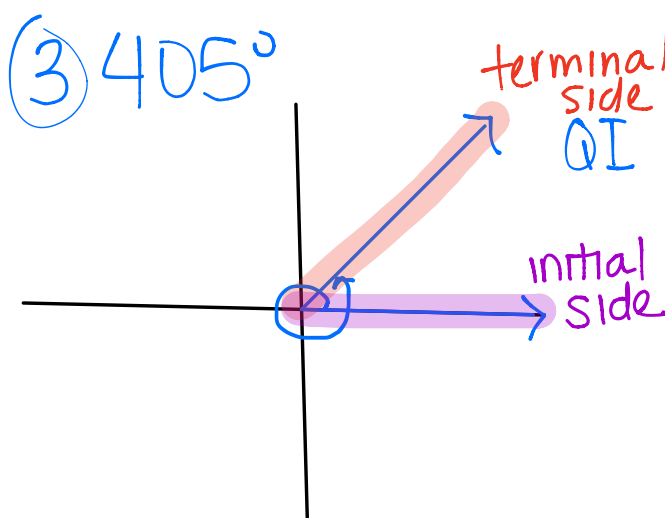
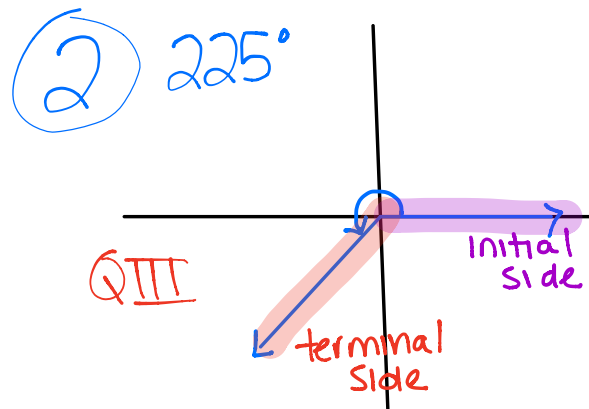
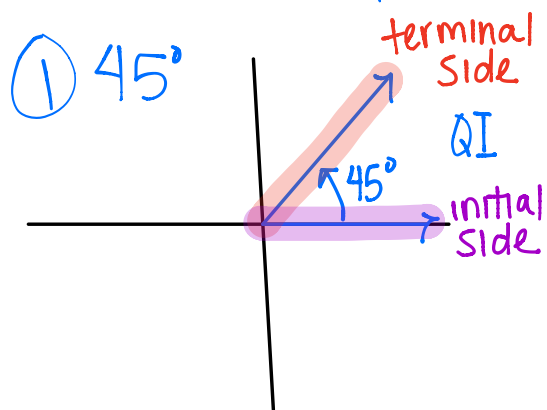


# Sketching Angles: Examples:



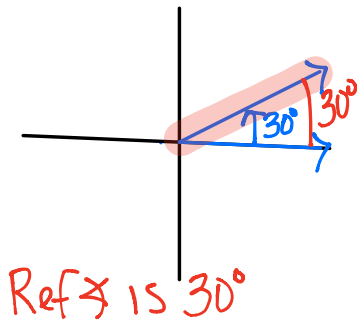
## Reference Angle:

\*it is the smallest angle between the terminal side and the x-axis

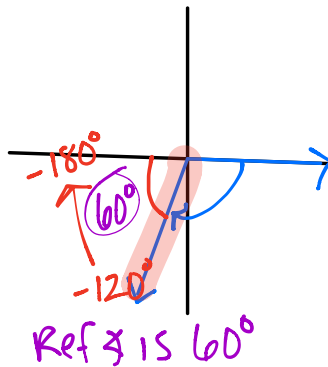
\*it will always be 90 degrees or less, and positive

# Examples:

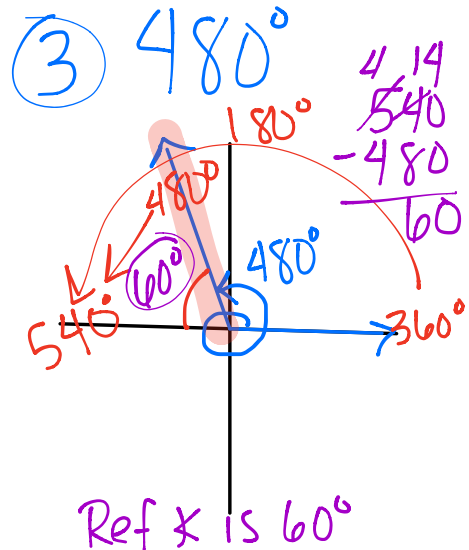
①  $30^\circ$



②  $-120^\circ$



③  $480^\circ$



# Coterminal Angles:

\*2 angles with the same initial and terminal sides

\*to find these coterminal angles, you always want to add or subtract 360 degrees or 2 pi

# Examples:

① Find a coterminal angle between 0 degrees and 360 degrees:

a)  $733^\circ$

$$733 - 360 = 373^\circ$$

$$373 - 360 = 13^\circ$$

$$b) 562^\circ$$

$$562 - 360 = 202^\circ$$

② Find one positive and one negative coterminal angle:

$$a) -100^\circ$$

$$-100 + 360 = 260^\circ \rightarrow \text{one positive coterminal angle}$$

$$-100 - 360 = -460^\circ \rightarrow \text{one negative coterminal angle}$$

$$b) 52^\circ$$

$$52 + 360 = 412^\circ \rightarrow \text{positive}$$

$$52 - 360 = -308^\circ \rightarrow \text{negative}$$

③ Find a coterminal angle between 0 and  $2\pi$ :

$$a) \frac{12\pi}{5} = 1$$

$$\frac{12\pi}{5} - \frac{2\pi}{1} \cdot \frac{5}{5} = \frac{12\pi}{5} - \frac{10\pi}{5} = \frac{2\pi}{5}$$

$\underbrace{\quad}_{\times 5}$

$$b) \frac{-2\pi}{3}$$

$$\frac{-2\pi}{3} + \frac{2\pi \cdot 3}{3} = \frac{-2\pi}{3} + \frac{6\pi}{3} = \frac{4\pi}{3}$$

④ Find one positive and one negative coterminal angle:

$$a) \frac{11\pi}{4}$$

$$\frac{11\pi}{4} - \frac{2\pi \cdot 4}{4} = \frac{11\pi}{4} - \frac{8\pi}{4} = \frac{3\pi}{4}$$

→ positive coterminal angle

→ negative coterminal angle

$$\frac{3\pi}{4} - \frac{2\pi \cdot 4}{4} = \frac{3\pi}{4} - \frac{8\pi}{4} = \frac{-5\pi}{4}$$

$$b) \frac{5\pi}{4} + \frac{2\pi \cdot 4}{4} = \frac{5\pi}{4} + \frac{8\pi}{4} = \frac{13\pi}{4}$$

positive

$$\frac{5\pi}{4} - \frac{2\pi}{1} = \frac{5\pi}{4} - \frac{8\pi}{4} = \frac{-3\pi}{4}$$

negative