

$$2\pi = 360^\circ$$

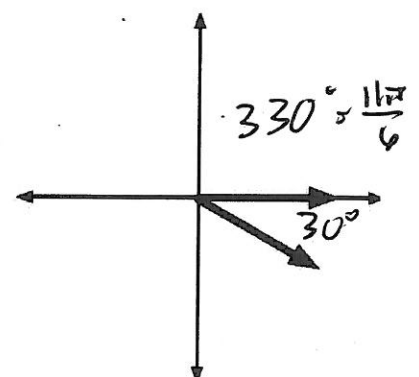
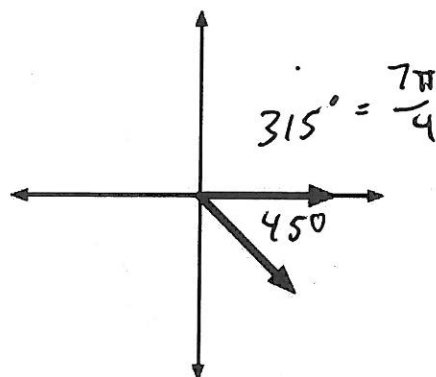
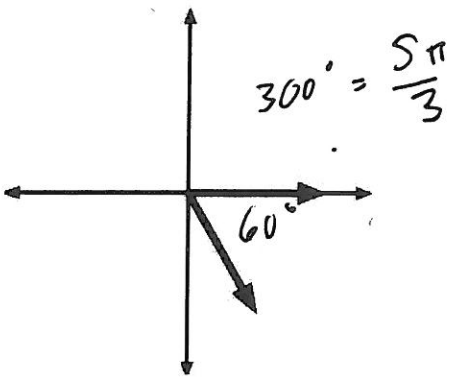
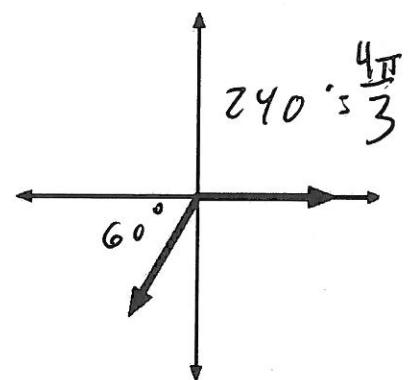
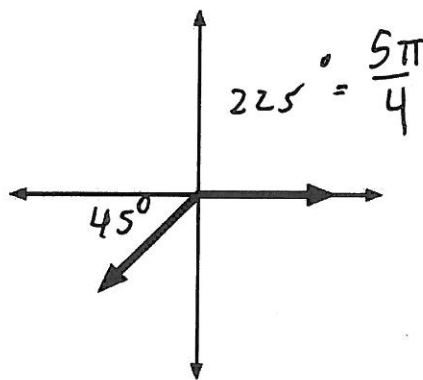
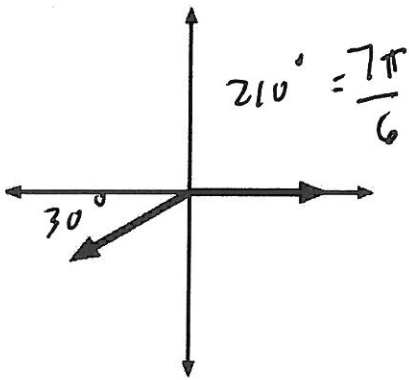
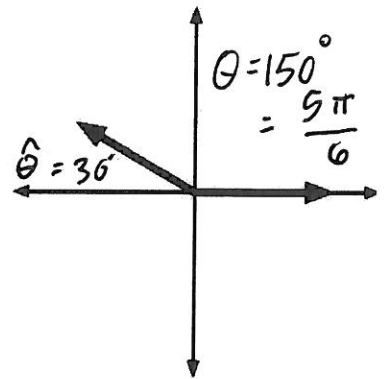
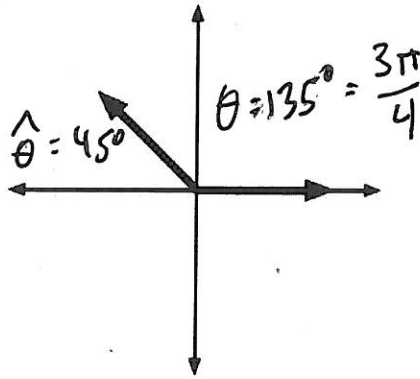
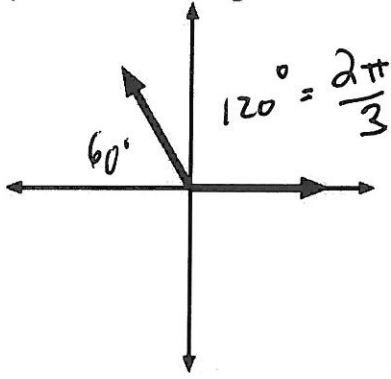
$$1 \text{ rad} \neq 1 \pi \text{ rad.}$$

$$\pi = 180^\circ$$

$$60^\circ = \frac{\pi}{3} \quad 45^\circ = \frac{\pi}{4} \quad 30^\circ = \frac{\pi}{6}$$

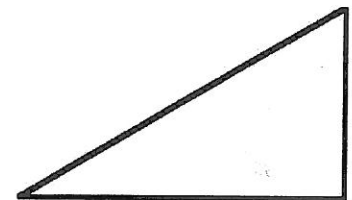
Reference Angles...

Skaters can do 720s and I think Tony Hawk maybe did a 1080...well, in trig we also need to go beyond 90 frequently. To figure out what positive angle you've rotated you start along the positive x-axis and then rotate counter clockwise. Each angle shown here is one of the following: 150, 210, 330, 120, 240, 300, 135, 225, 315 degrees. Figure out which is which and then convert them to radians. Write your answers right next to the angles.



A reference angle is an acute angle formed between the terminal side and the x-axis (think of the triangles you drew before...), all of these angles shown here have reference angles of 30, 45, or 60 degrees.

Figure out which have which. Hint: 45 reference angles cut the quadrants in half, 30 degrees are smaller, 60s are bigger... That's a 30-60-90 if you want to cut it out and use it to help!



Summarize what you just found out by filling in the table:

θ	degrees is basically a	$\hat{\theta}$	degree angle in quadrant	
120	degrees is basically a	60	degree angle in quadrant	II
135		45		II
150		30		II
210		30		III
225		45		III
240		60		III
300		60		IV
315		45		IV
330		30		IV

Now, for the pay off, See if you can come up with a rule for finding the **reference angle** for any angle in the II, III, and IV quadrant. A reference angle is the angle that a non-quadrantal angle "basically is" in its respective quadrant. Hint: Your rules will not involve 90 or 270 degrees.

Rule for Quadrant II: $\hat{\theta} = 180 - \theta$

Rule Q I: $\hat{\theta} = \theta$

Rule for Quadrant III: $\hat{\theta} = \theta - 180$

Rule for Quadrant IV: $\hat{\theta} = 360 - \theta$

The relationship between angles and their reference angles: The absolute value of the trigonometric functions of an angle will equal the trigonometric functions of the reference angle. If you think about it, learning these few facts will mean you have to memorize far less.

Reference angles in standard position on the Unit Circle \rightarrow center at $(0,0)$ and radius of 1.

