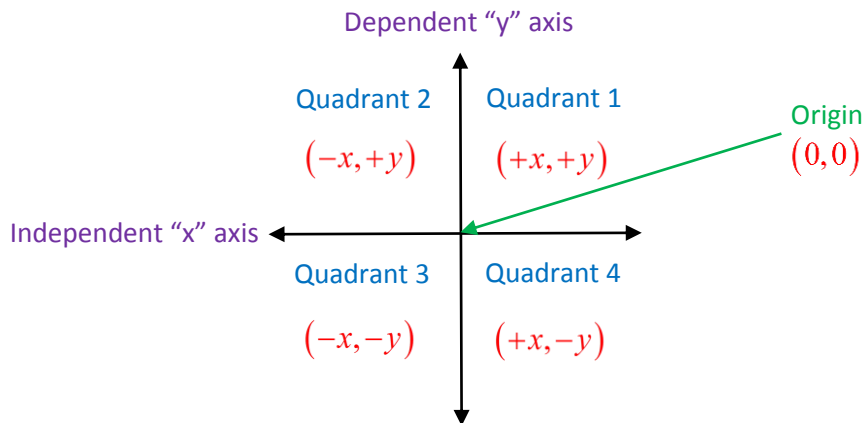
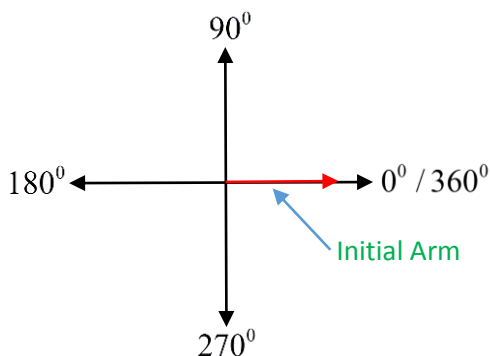


Let's do a quick review of the coordinate plane and some key terms.

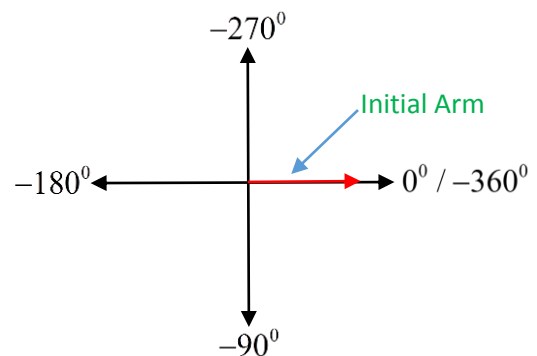


The "unit circle" and rotations.

- A unit circle is any circle that has its center at the **origin (0, 0)** and a **radius of 1 unit**
- When you begin the rotation of any unit circle, always begin on the (+)ve 'x'-axis
- The line in which the rotation begins is known as the "**initial arm**"
- The line that is rotating around the circle is the "**terminal arm**"
- If the rotation is **counter-clockwise**, the terminal arm will always move in a **(+)ve direction**
- If the rotation is **clockwise**, the terminal arm will always move in a **(-)ve direction**



The terminal arm is rotating **counter-clockwise**, so the **angle** will always be **(+)ve**



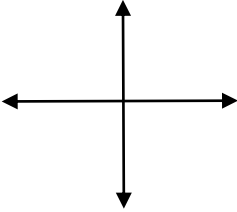
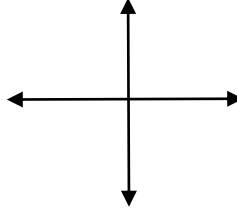
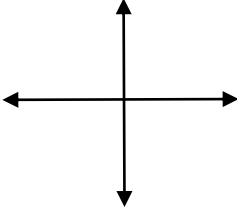
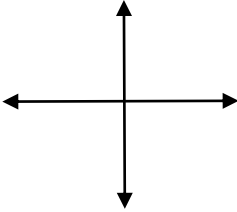
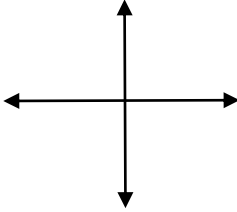
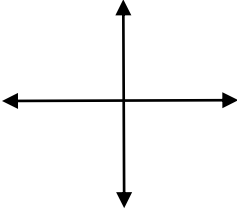
The terminal arm is rotating **clockwise**, so the **angle** will always be **(-)ve**

All angles in "**standard position**" must begin from the initial arm, (+)ve x-axis

Any angle can be created by rotating the terminal arm around the circle

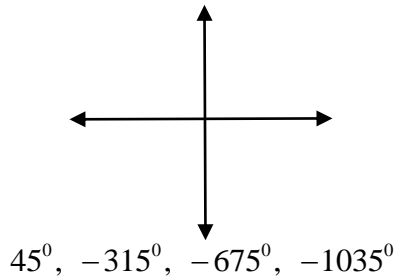
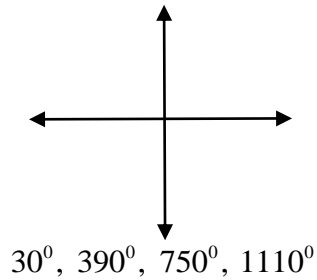
- Remember: **counter-clockwise = (+)ve angle** and **clockwise = (-)ve angle**

Example 1: Draw the following angles in standard position.

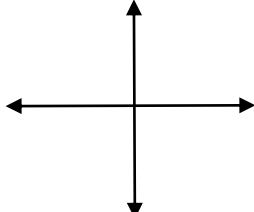
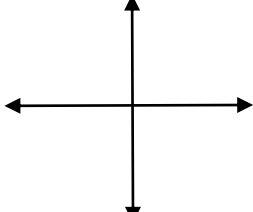
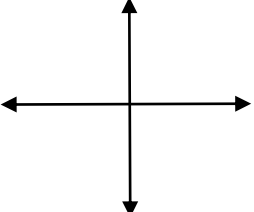
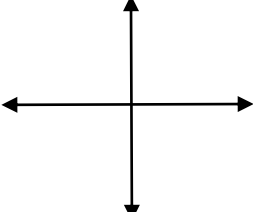
a) 135° 	b) -120° 	c) 215° 
d) -150° 	e) 300° 	f) -330° 

Co-terminal angles are angles that have the terminal arm ending in exactly the same position, regardless of the number of rotations.

- All co-terminal angles are multiples of 360° or a difference of 360°



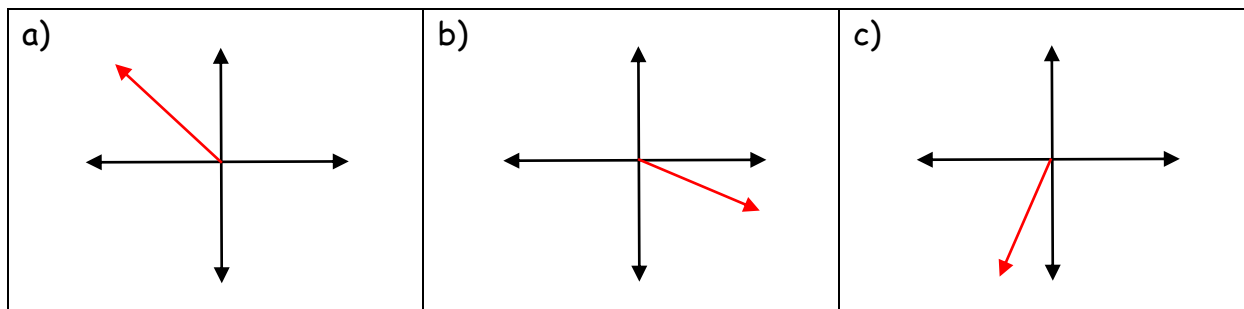
Example 2: Provide 2 co-terminal angles and draw the location of the terminal arm

a) 25° 	b) -50° 	c) 130° 	d) -125° 
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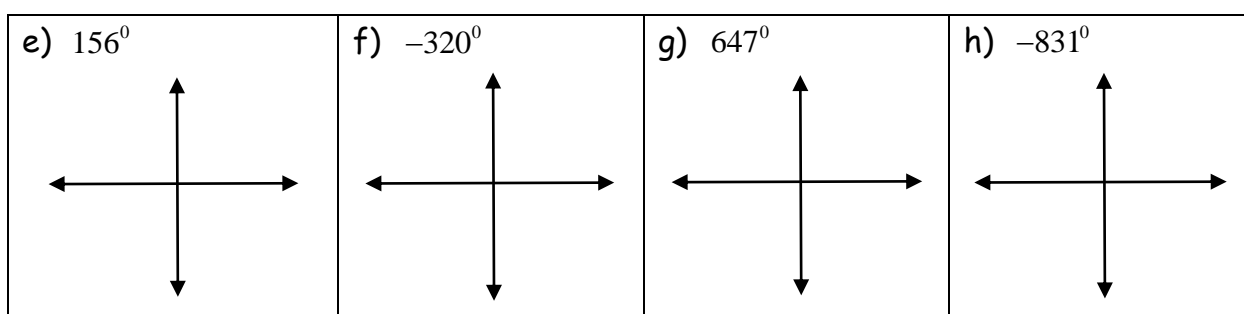
A "**reference angle**" is any angle created by the terminal arm and the 'x'-axis

- They must be in the same quadrant as the terminal arm
- All reference angles are absolute, ie, they are always positive

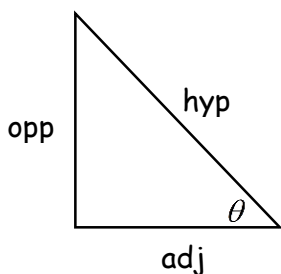
Example 3: Given the position of the terminal arm, indicate the reference angle.



Example 4: Given an angle in standard position, determine the reference angle.



If you recall, from Precalculus 10, these are the trigonometric ratios that are used to calculate the sides and angles of any right triangle.



$$\sin \theta = \frac{opp}{hyp}$$

$$\cos \theta = \frac{adj}{hyp}$$

$$\tan \theta = \frac{opp}{adj}$$

Use Pythagoras Theorem to calculate the unknown side of any right triangle as long as 2 other sides are known $hyp = \sqrt{opp^2 + adj^2}$

Example 5: Point P(4, 7), is on the terminal arm of an angle θ in standard position.

<p>a) Calculate the distance 'r' from the origin to P.</p>	<p>b) Give the trigonometric ratios for θ.</p>	<p>c) Determine the measure of angle θ.</p>
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Example 6: The pendulum arm of a grandfather clock is 1.3m long and swings left and right from a start position of 80° to 100° . What is the total horizontal distance the pendulum moves in one complete swing?

Homework: