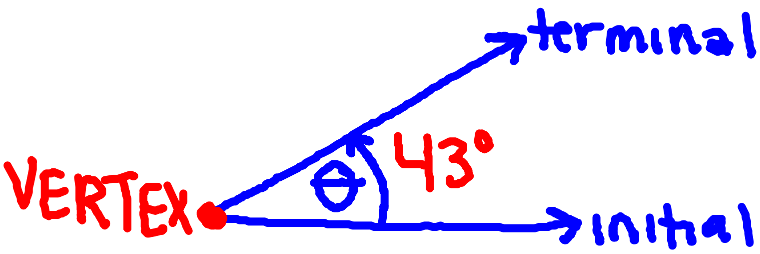
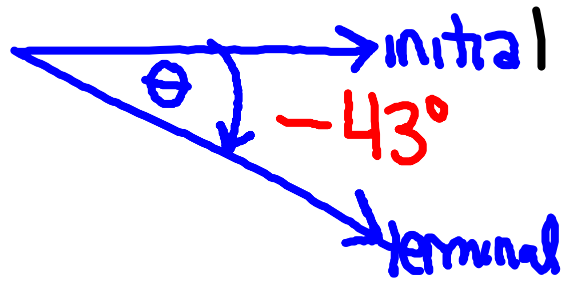
U2:L1 Angles in Standard Position

In trigonometry, angles are made with an initial arm and terminal arm

If the angle of rotation is counterclockwise, then the angle is $\oplus$



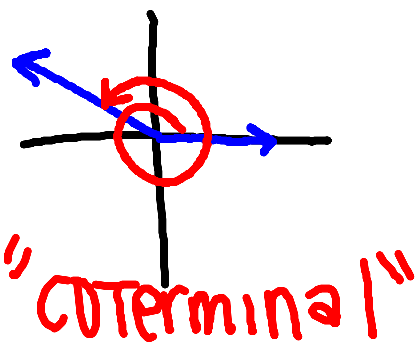


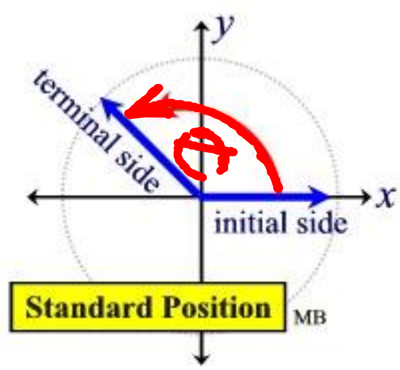
We create angles on Cartesian Planes

The **initial arm** is always along the x axis and is our starting position.

The angle is made at the point of origin (0,0)

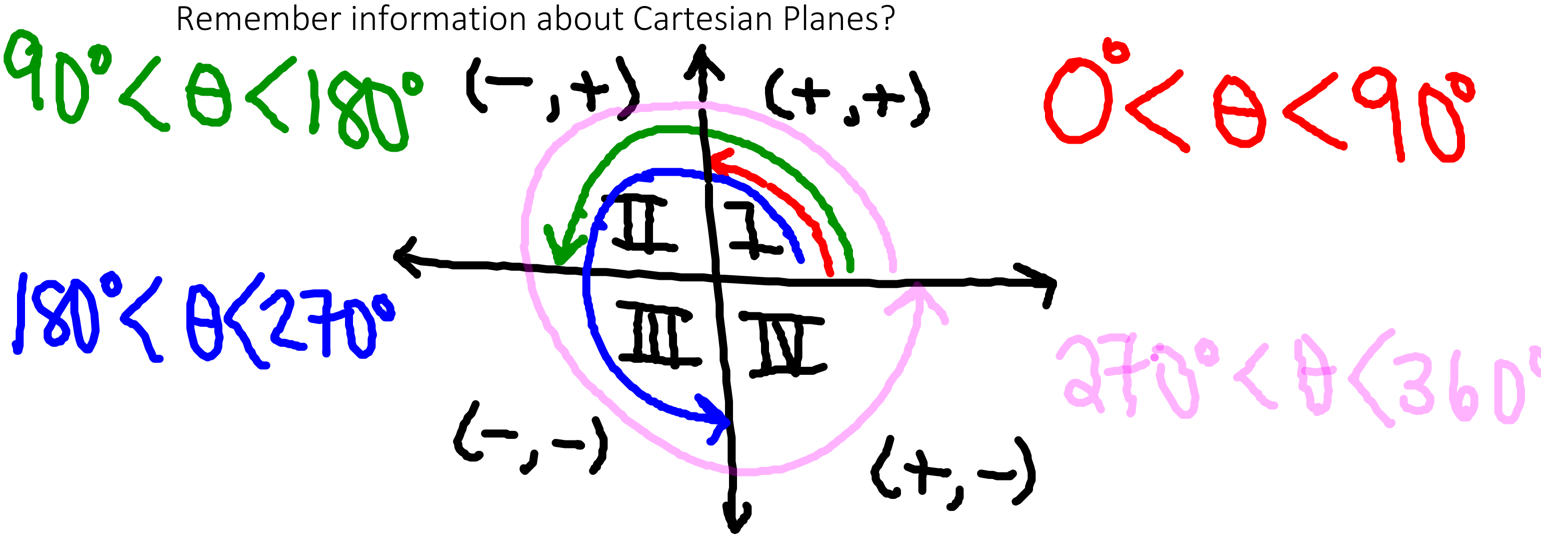
The **final position**, after the rotation about the origin, is the terminal arm





If an angle is set up as such, it is considered an **angle in** STANDARD POSITION

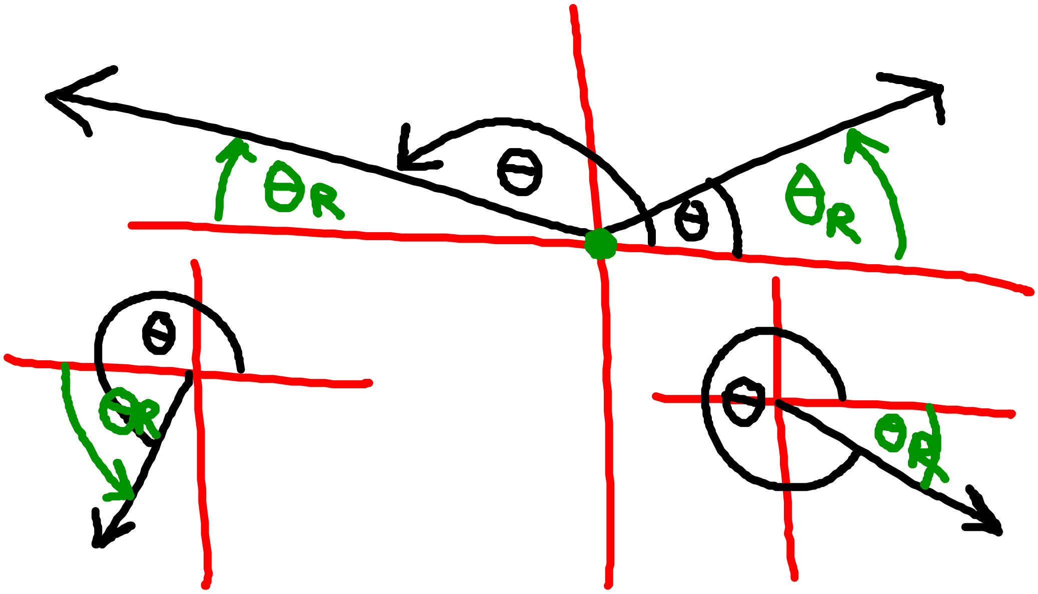
Remember information about Cartesian Planes?



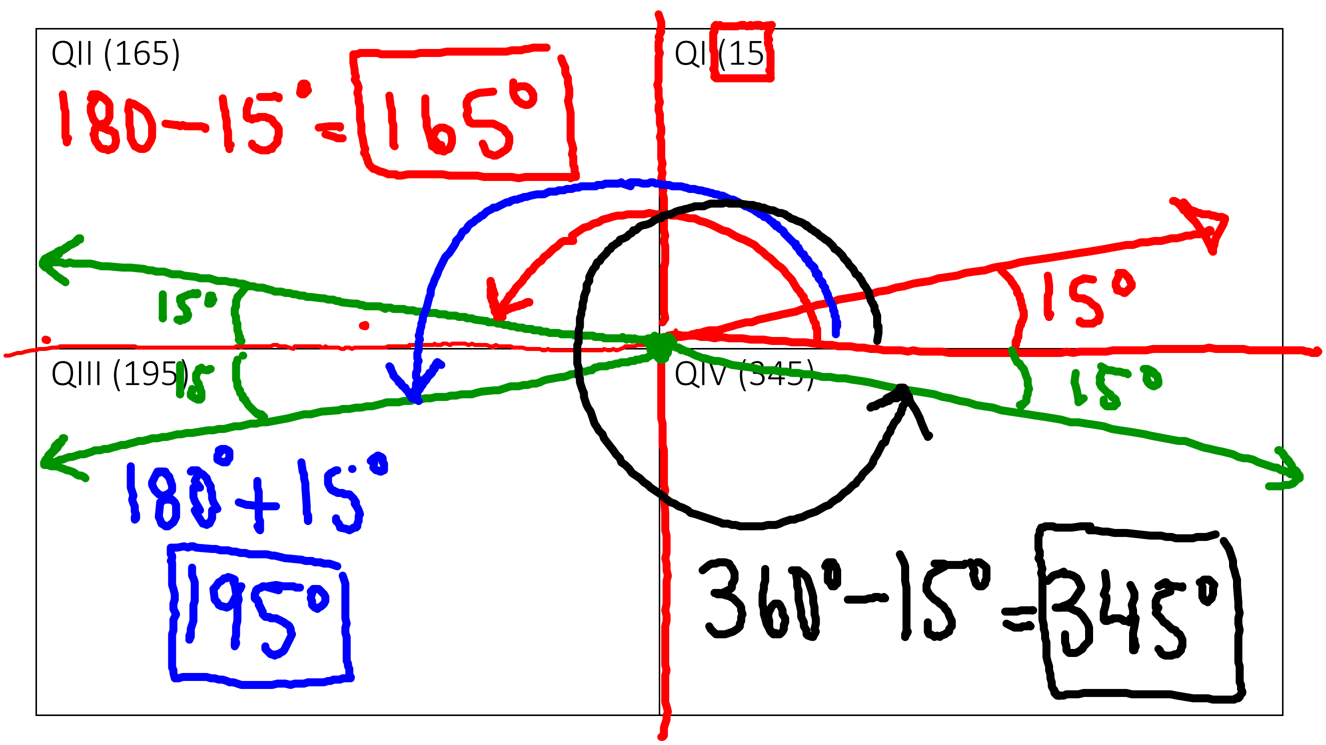
For each angle in standard position, we also have a reference angle

Reference angles (θ_R) are:

- same terminal arm
- vertex @ origin
- initial arm @ x axis



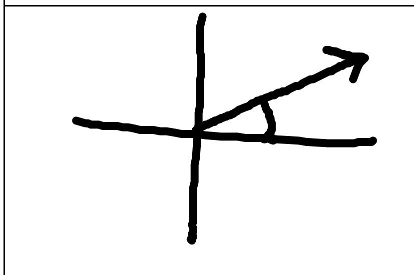
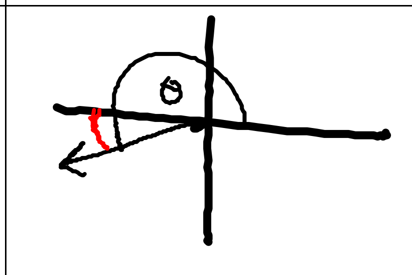
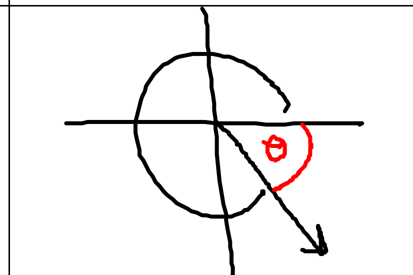
Example: Find the angles which all have a reference angle of 15°.



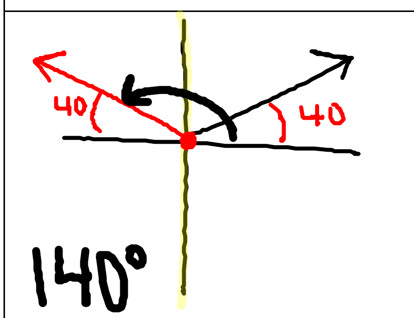
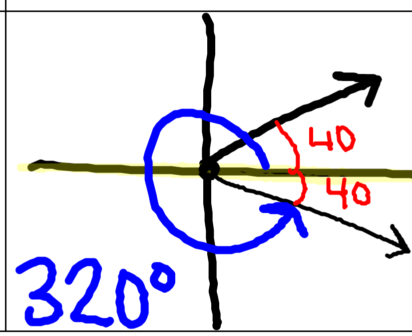
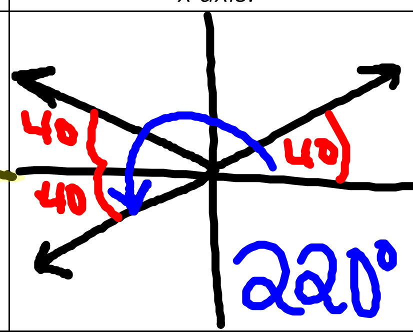
To find the angles, ADD or SUBTRACT the θ_R from 180° and 360° (x axis)

Examples:

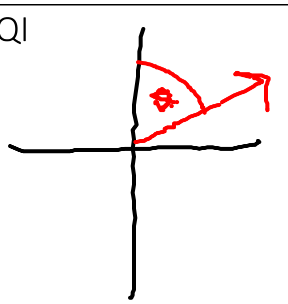
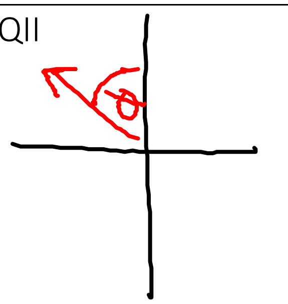
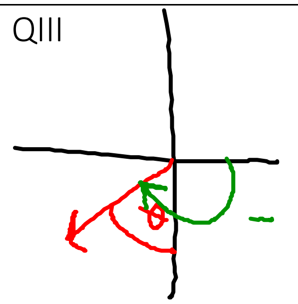
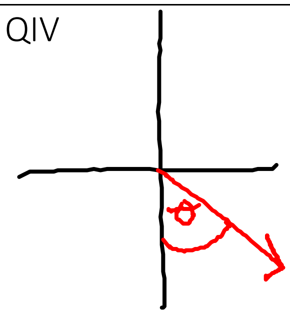
Sketch each angle in standard position. What quadrant are the terminal arms in? What are their reference angles?

37°	207°	314°
		
Q? I	Q? III	Q? IV
$\boldsymbol{\theta_R}$? 37°	$\boldsymbol{\theta_R}$? 27°	$\boldsymbol{\theta_R}$? 46°

Determine the angle in standard position of an angle of 40° when it is:

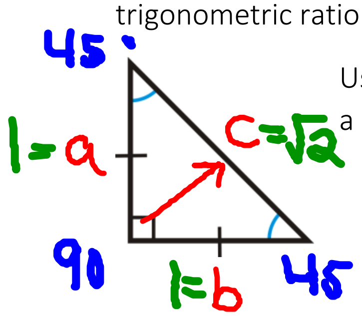
Reflected over the y axis	*Reflected over the x axis*	*Reflected over the y and then x axis.*
		

Draw an angle in each quadrant that is not in standard position:

QI	QII	QIII	QIV
			

Special Right Triangles

For the angles $30, 45°, 60°$ you can determine the exact values of their trigonometric ratio.



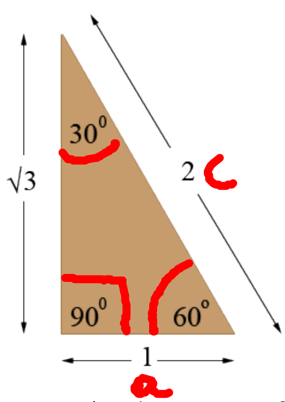
Using Pythagoras Theorem, we can solve for "c" for this special 45 triangle, with a side length of 1 unit.

$$c^2 = a^2 + b^2$$
$$c^2 = 1^2 + 1^2$$
$$c^2 = 1 + 1$$
$$\sqrt{c^2} = \sqrt{2}$$
$$c = \sqrt{2}$$

sin	$\frac{O}{H}$	$\frac{1}{\sqrt{2}}$
cos	$\frac{A}{H}$	$\frac{1}{\sqrt{2}}$
tan	$\frac{O}{A}$	$\frac{1}{1} = 1$

The same can be done with a special 30 triangle, and special 60 triangle.

$$c^2 = a^2 + b^2$$
$$c^2 = 1^2 + \sqrt{3}^2$$
$$c^2 = 1 + 3$$
$$\sqrt{c^2} = \sqrt{4}$$
$$\boxed{c = 2}$$



	30°	60°
sin	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$
cos	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$
tan	$\frac{1}{\sqrt{3}}$	$\frac{\sqrt{3}}{1} = \sqrt{3}$

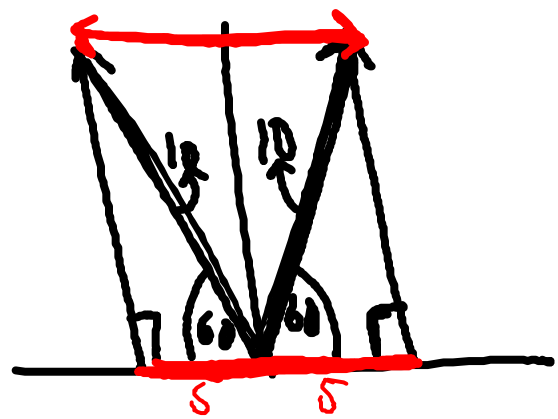
Ex: A metronome (with an arm of 10 cm) swings from 60° to 120°. What horizontal distance does the tip of the arm move in one beat?

$$\cos = \frac{A}{H}$$
$$\cos 60° = \frac{x}{10}$$
$$\frac{1}{2} = \frac{x}{10}$$
$$x = 5$$

distance

$5 + 5$

$\boxed{10 \text{ cm}}$



PRACTICE: Pages 83 – 87 (Q1, 2, 5, 8, 10, 13, 21)