

Exploring Trigonometric Ratios for Angles Greater than 90°

Angles in Standard Position

standard position

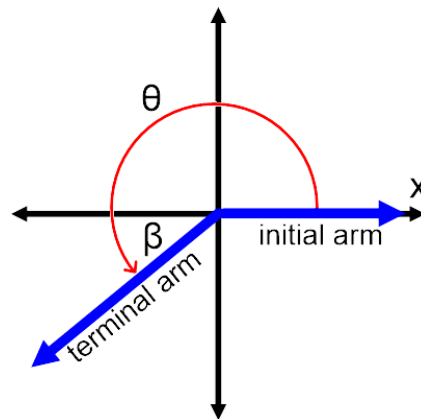
an angle in the Cartesian plane whose vertex lies at the origin and whose initial arm lies on the positive x-axis. Angle θ is measured from the initial arm to the terminal arm.

principal angle (θ)

the counter clockwise angle between the initial arm and the terminal arm of an angle in standard position. Its value is between 0° and 360° .

related acute angle (β)

the acute angle between the terminal arm of an angle in standard position and the x-axis when the terminal arm lies in quadrants 2, 3, or 4. Its value is between 0° and 90° .



Investigation

1. Sketch the angles given in the space provided in standard form. Be sure to include the principal angle and the related acute angle for each. Then complete the table that follows.

Angle	45°	135°	225°	315°
Sketch				

Principal Angle θ	Quadrant #	Related Acute Angle β	$\sin \theta$	$\cos \theta$	$\tan \theta$
45°	1	45°	0.707	0.707	1
135°					
225°					
315°					

2. Sketch the angles given in the space provided in standard form. Be sure to include the principal angle and the related acute angle for each. Then complete the table that follows.

Angle	30°	150°	210°	330°
Sketch				

Principal Angle θ	Quadrant #	Related Acute Angle β	$\sin \theta$	$\cos \theta$	$\tan \theta$
30°					
150°					
210°					
330°					

3. Sketch the angles given in the space provided in standard form. Be sure to include the principal angle and the related acute angle for each. Then complete the table that follows.

Angle	60°	120°	240°	300°
Sketch				

Principal Angle θ	Quadrant #	Related Acute Angle β	$\sin \theta$	$\cos \theta$	$\tan \theta$
60°					
120°					
240°					
300°					

Investigation Follow-Up

1. Look back at the tables you filled in, and complete the table below by writing the sign (+ or -) on each trigonometric ratio in the given quadrant.

Trigonometric Ratio	Quadrant			
	I	II	III	IV
sine				
cosine				
tangent				

2. State all the angles between 0° and 360° that make each equation true. Verify with your calculator.

a. $\sin 53^\circ = \sin \underline{\hspace{2cm}}$

b. $\tan 130^\circ = -\tan \underline{\hspace{2cm}}$

c. $\sin(-40^\circ) = \sin \underline{\hspace{2cm}}$

d. $-\cos(-113^\circ) = \cos \underline{\hspace{2cm}}$

3. Given some angle θ where $0 \leq \theta \leq 90$, if $\sin \theta = k$,
- Determine all angles between 0 and 360 where $\sin \theta = k$.
 - Determine all angles between 0 and 360 where $\sin \theta = -k$.