

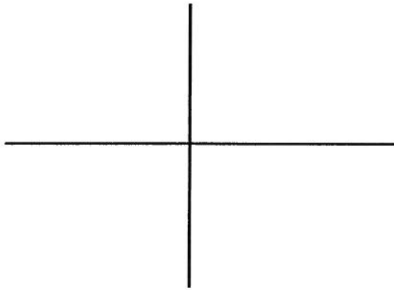
ALGEBRA 2H

Section 13.2: General Angles - Angles of Rotation

NOTES

I. Angles of Rotation

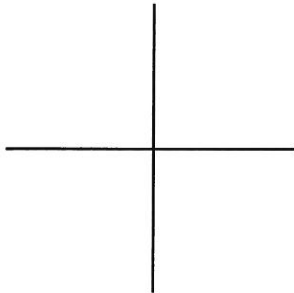
1. **Standard Position:** An angle in standard position has its vertex at the origin and its initial (beginning) ray on the positive x-axis. The terminal (final) ray can be anywhere in the xy-plane. This allows for angles of any size, including angles larger than 180 degrees and even negative angle measures. If an angle is negative it means the direction in which the angle is drawn is backwards.



- (a) The positive angle direction is _____
(b) The negative angle direction is _____

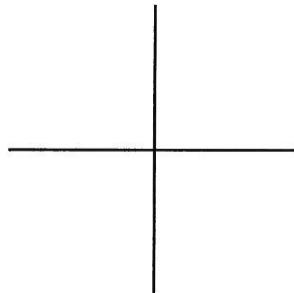
2. Draw the following angles in standard position. Then give another name for the angle.

(a) 60°



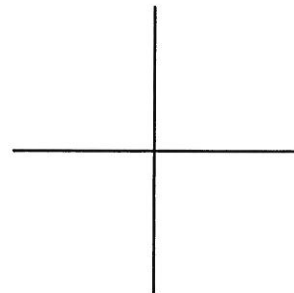
(a) _____

(b) 200°



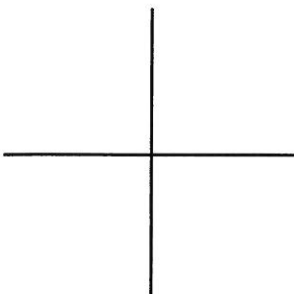
(b) _____

(c) -50°



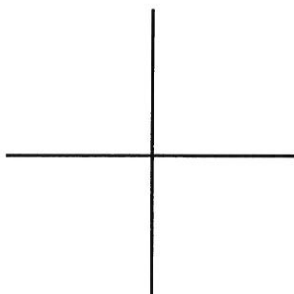
(c) _____

(d) 400°



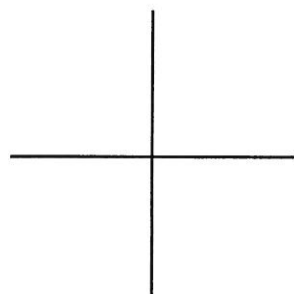
(a) _____

(e) -250°



(b) _____

(f) 810°



(c) _____

3. **Coterminal Angles:** Angles that have the same terminal ray (all angles have the same initial ray).

Coterminal angles can be found by adding or subtracting _____ from the given angle.

Example: Find 2 coterminal angles for each angle below.

(a) 100°

(b) -75°

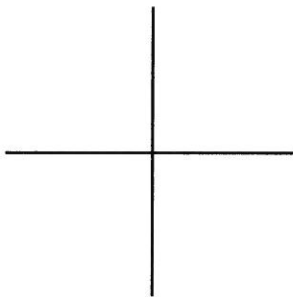
II. Reference Angles

1. Definition: the acute positive angle formed by the terminal ray of an angle θ and the _____.

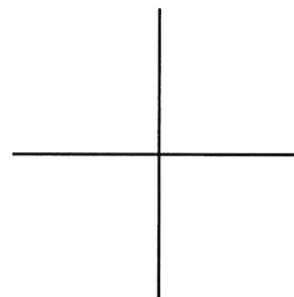
2. Symbols for a reference angle: _____

Examples: Draw each angle θ and find the reference angle.

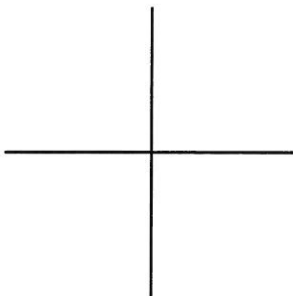
(a) $\theta = 50^\circ$ $\alpha =$ _____



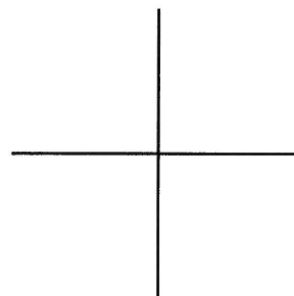
(b) $\theta = 150^\circ$ $\alpha =$ _____



(c) $\theta = 260^\circ$ $\alpha =$ _____



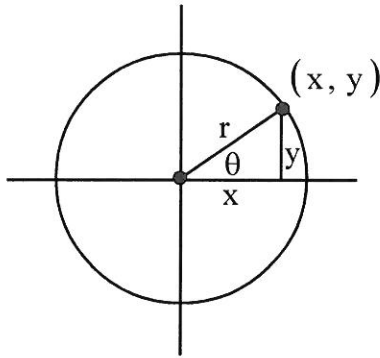
(d) $\theta = 315^\circ$ $\alpha =$ _____



3. The sine, cosine, or tangent of the reference angle for a given angle gives the _____ of the trig value of the given angle θ . The quadrant in which the terminal ray of the given angle θ lies determines the sign of the trig function.

III. Trigonometric Functions and Angles of Rotation

1. Trig. definitions in the xy-plane:



$$\sin \theta = \underline{\hspace{2cm}}$$

$$\cos \theta = \underline{\hspace{2cm}}$$

$$\tan \theta = \underline{\hspace{2cm}}$$

$$\cot \theta = \underline{\hspace{2cm}}$$

$$\sec \theta = \underline{\hspace{2cm}}$$

$$\csc \theta = \underline{\hspace{2cm}}$$

Also, the Pythagorean Theorem applies to the triangle, so $\underline{\hspace{2cm}}$.

2. Examples:

- (a) If the terminal ray of an angle passes through the point $P(-3, 4)$, find the value of all six trig functions for this angle.

Draw a picture!

$$\sin \theta = \underline{\hspace{2cm}} \quad \cos \theta = \underline{\hspace{2cm}}$$

$$\tan \theta = \underline{\hspace{2cm}} \quad \cot \theta = \underline{\hspace{2cm}}$$

$$\sec \theta = \underline{\hspace{2cm}} \quad \csc \theta = \underline{\hspace{2cm}}$$

- (b) If the terminal ray of an angle passes through the point $P(-2, -3)$, find the exact value of all six trig functions for this angle.

Draw a picture!

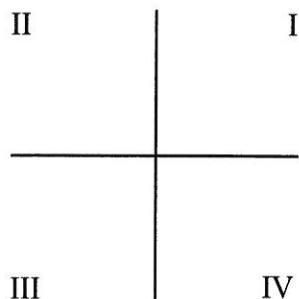
$$\sin \theta = \underline{\hspace{2cm}} \quad \cos \theta = \underline{\hspace{2cm}}$$

$$\tan \theta = \underline{\hspace{2cm}} \quad \cot \theta = \underline{\hspace{2cm}}$$

$$\sec \theta = \underline{\hspace{2cm}} \quad \csc \theta = \underline{\hspace{2cm}}$$

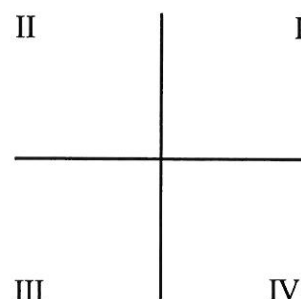
IV. Quadrant Rules:

1. In each quadrant label where x and y are positive and negative.



2. Identify the quadrants where each trig. function is positive.

Note: r is always positive, but x and y can be negative



3. **Example:** State whether the given trig function will be positive or negative.

(a) $\cos 150^\circ$ _____

(b) $\tan 240^\circ$ _____

(c) $\csc 100^\circ$ _____

(d) $\cot 330^\circ$ _____

4. **Example:** If θ is a second quadrant angle and $\cos \theta = -\frac{5}{13}$, find the exact value of the other 5 trig functions.

Draw a picture!

$\sin \theta =$ _____

$\tan \theta =$ _____ $\cot \theta =$ _____

$\sec \theta =$ _____ $\csc \theta =$ _____