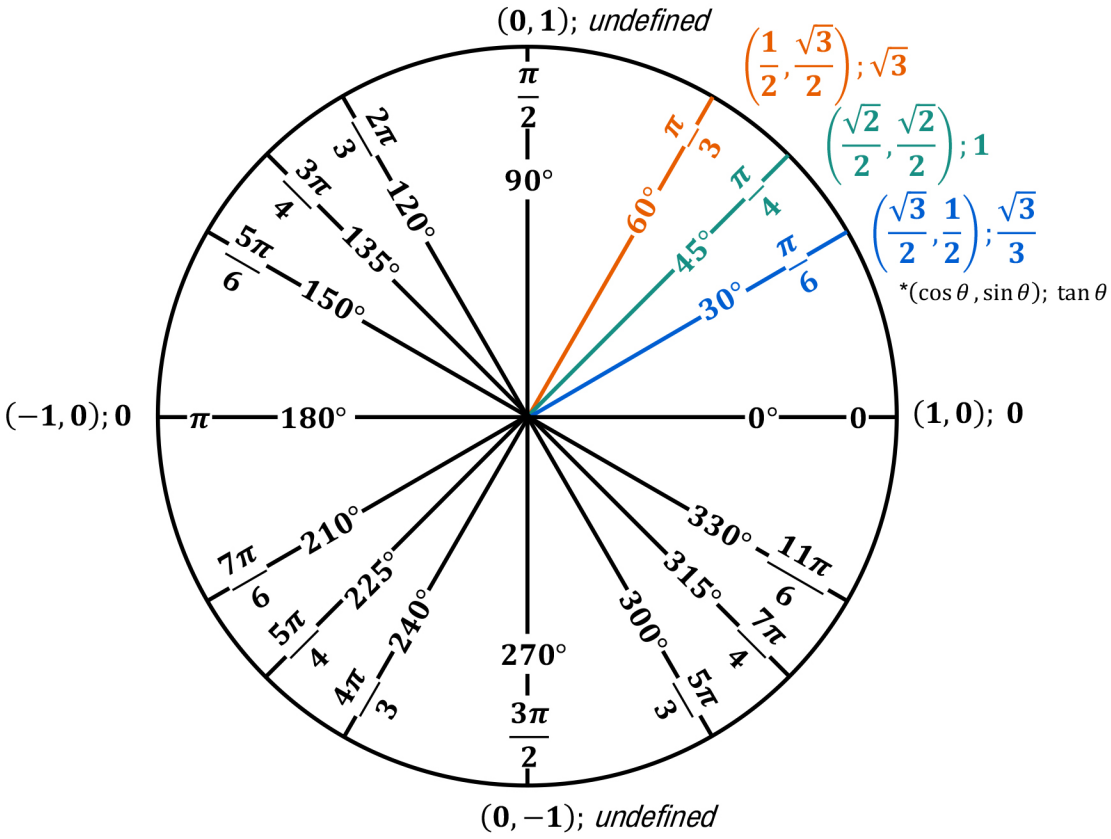
TOPIC: REFERENCE ANGLES

Reference Angles on the Unit Circle

◆ When given angles not in Q1, link them back to *known* Q1 angles (30°/45°/60°) by finding their **reference angle**.

- To do this, measure from the *given angle* directly to the _____ part of the x-axis & write as a positive number.



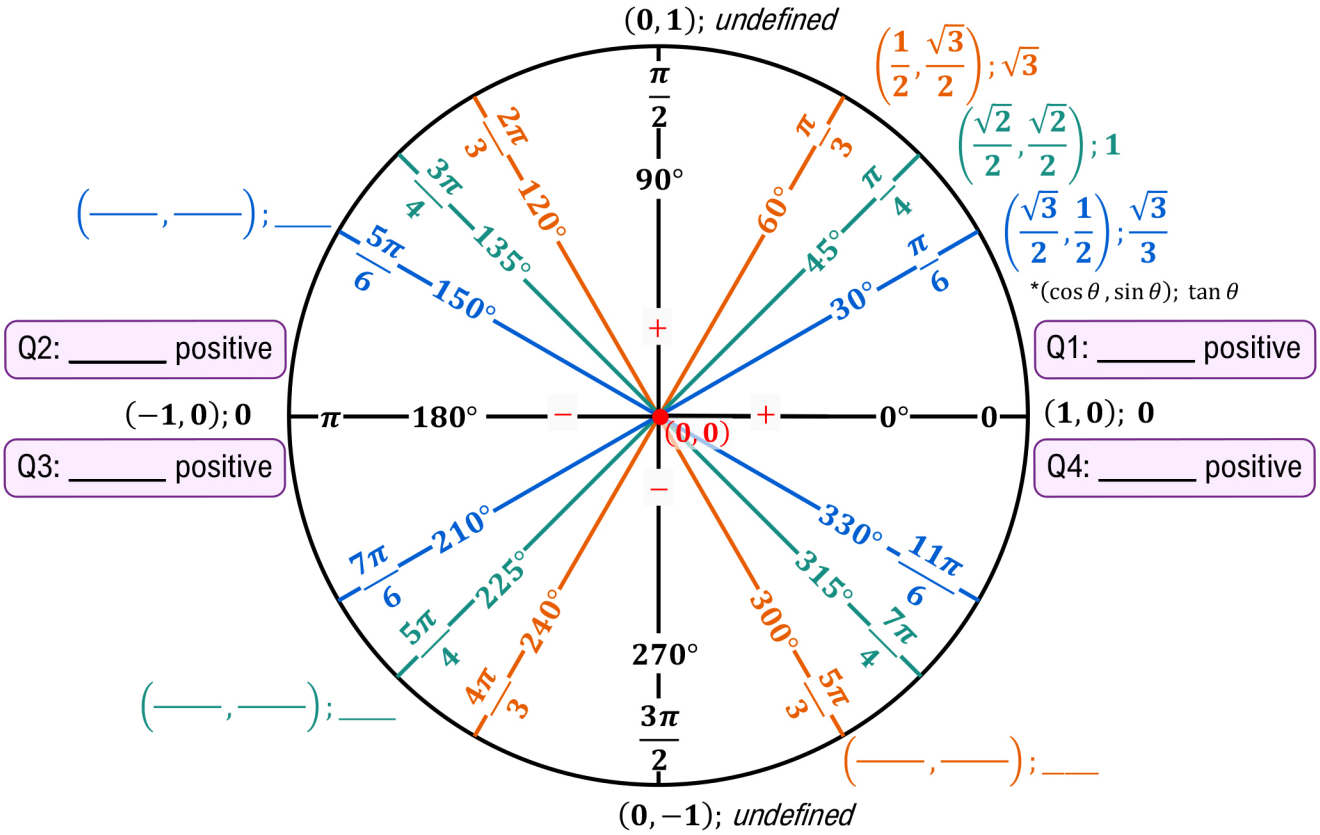
PRACTICE Identify the reference angle of each given angle.

(*A*)	(*B*)	(*C*)
$120°$	$\frac{7\pi}{4}$	$210°$

TOPIC: REFERENCE ANGLES

Trig Values in Quadrants II, III, & IV

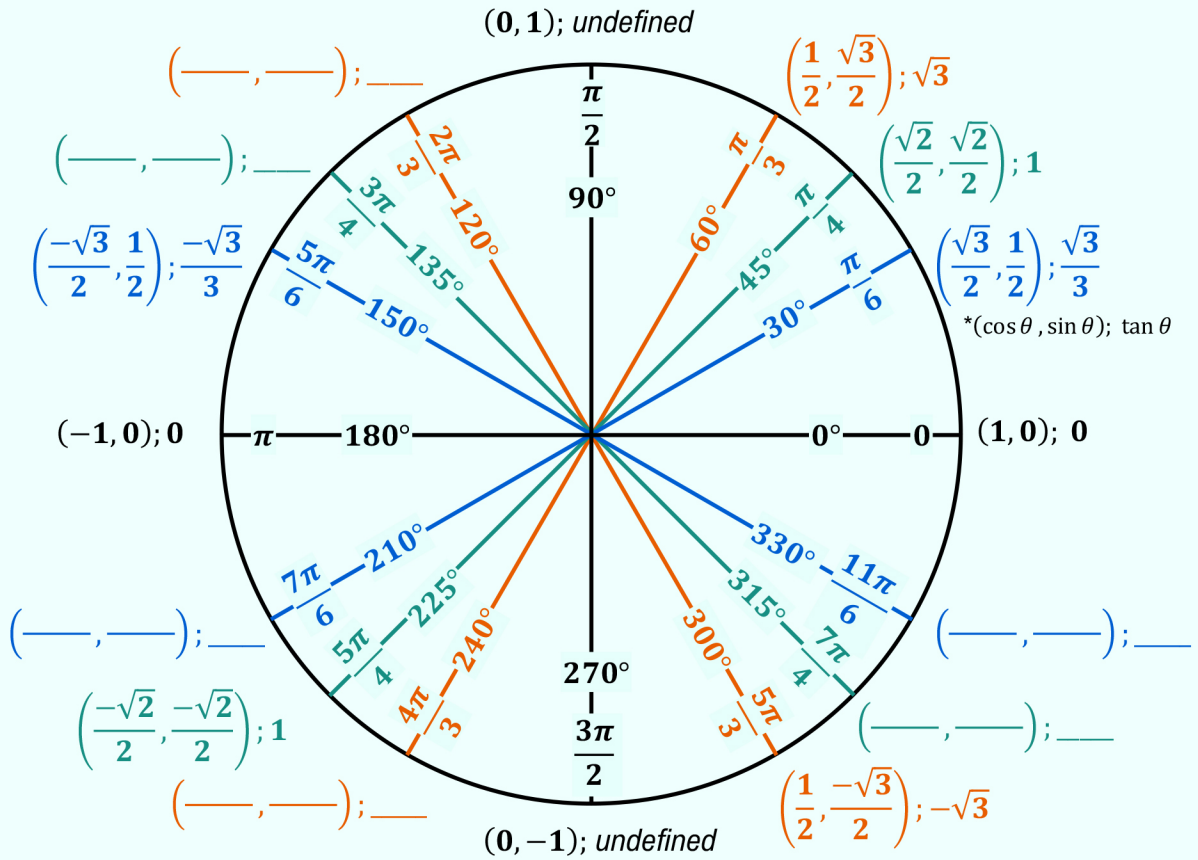
- The sin, cos, & tan of angles *NOT* in Q1 have the same **value** as the sin, cos, & tan of their reference angles.
  - *HOWEVER*, the _____ of the values will change based on their quadrant.



ASTC (All Students Take Calculus)

TOPIC: REFERENCE ANGLES

EXAMPLE Use reference angles to complete the missing trig values in quadrants II, III, & IV of the unit circle.



PRACTICE Identify what angle, θ, satisfies the following conditions.

(***A***)

$\sin\theta = \frac{1}{2}; \tan\theta < 0$

$\theta =$ _____

(***B***)

$\cos\theta = \frac{\sqrt{3}}{2}; \sin\theta < 0$

$\theta =$ _____

(***C***)

$\tan\theta = -1; \cos\theta > 0$

$\theta =$ _____

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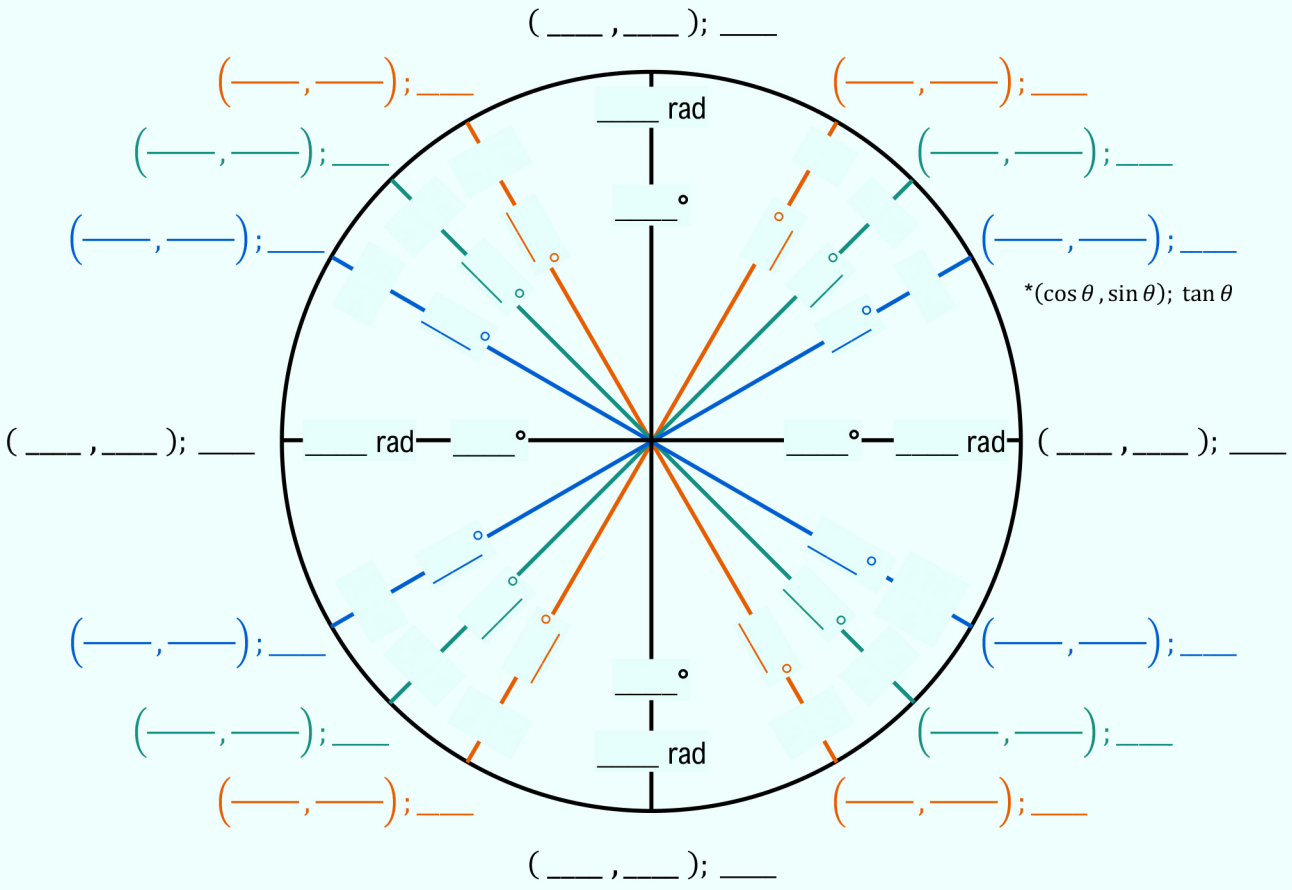
EXAMPLE Fill in all missing information in the unit circle below.

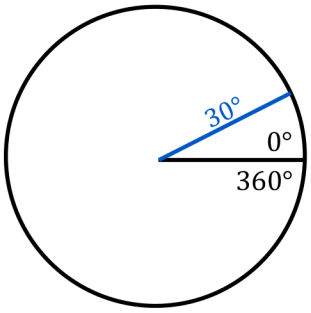


TOPIC: REFERENCE ANGLES

Coterminal Angles on the Unit Circle

◆ For angles > 360° or < 0°, use coterminal angles to find trig values, as they are equal to those on the unit circle.

- **Coterminal Angle**: Angle with the same terminal side as another angle between 0 & 360°.
- Find coterminal angles on the unit circle by adding/subtracting multiples of 360° (or 2π rad) to a given angle.



Recall **Coterminal Angle**

$\theta_2 \pm 360° \cdot n = \theta_1$

$390°$ _____ = _____

EXAMPLE Evaluate each trig function using coterminal angles on the unit circle.

(A)

$\tan 3\pi$

Coterminal Angle: _____

(B)

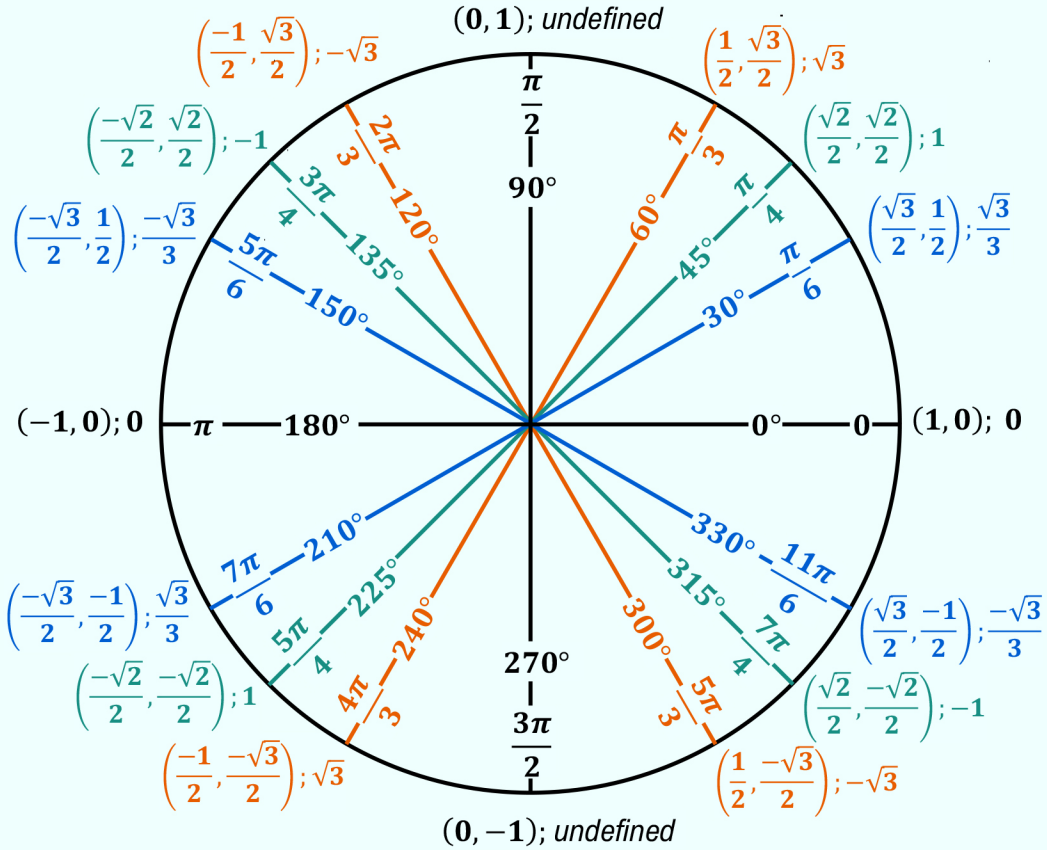
$\cos\left(-\frac{\pi}{4}\right)$

Coterminal Angle: _____

(C)

$\sin 390°$

Coterminal Angle: _____



TOPIC: REFERENCE ANGLES

PRACTICE For each expression, identify which coterminal angle to use & determine the exact value of the expression.

(***A***)

$$\sin\frac{7\pi}{3}$$

Coterminal Angle: _____

(***B***)

$$\tan 765°$$

Coterminal Angle: _____

(***C***)

$$\cos\left(-\frac{10\pi}{4}\right)$$

Coterminal Angle: _____