

Warm-up!

Trig Functions, Day 1:

- Radians and degrees
- Vocab

Homework

- Angle Vocab HW
- = 30 cm

1. There are 5 centimeters in 2 inches. Convert 1 foot to centimeters.

$$1 \cancel{\text{ft}} \times \frac{12 \cancel{\text{in}}}{1 \cancel{\text{ft}}} \times \frac{5 \text{ cm}}{2 \cancel{\text{in}}} = \frac{60}{2} \text{ cm}$$

2. There are 8 flimflabs in 3 rogs. Convert 2 flimflabs to rogs.

$$2 \cancel{\text{ff}} \times \frac{3 \text{ rog}}{8 \cancel{\text{ff}}} = \frac{6}{8} \text{ rog} = \frac{3}{4} \text{ rog}$$

3. There are 180° in π radians. Convert 15° to radians.

$$15^\circ \times \frac{\pi \text{ radians}}{180^\circ} = \frac{15\pi}{180} \text{ radians} = \frac{\pi}{12} \text{ radian}$$

Lowercase Theta: θ

Capital Theta: Θ

Zero: 0

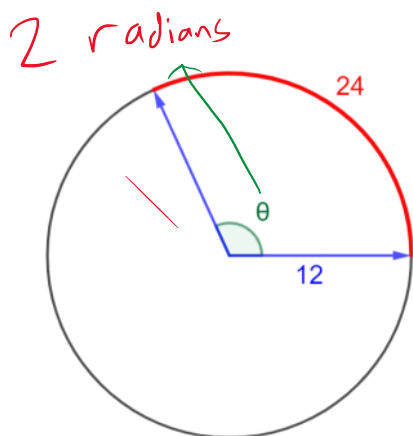
The First Letter is Oscar: O

Empty Set: $\emptyset$

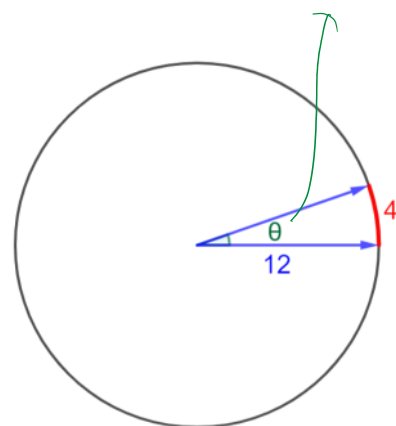
Degrees vs Radians - Defining a radian

In AP Precalculus, we judge our angles by how much crust they cut out of a pizza

Imagine I have a circle with radius 12...



How big is the angle θ ?

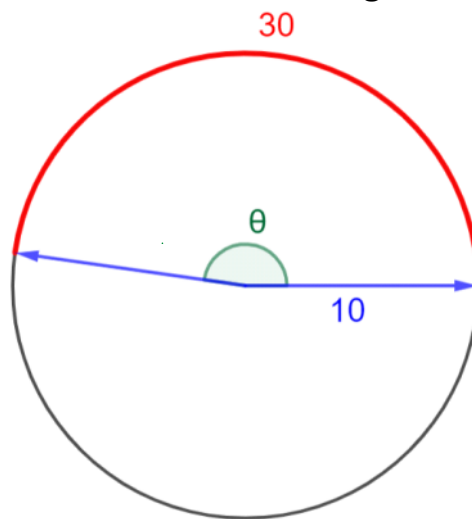


How big is the angle θ ?

Just making sure you got it...

Find the measure of θ in radians

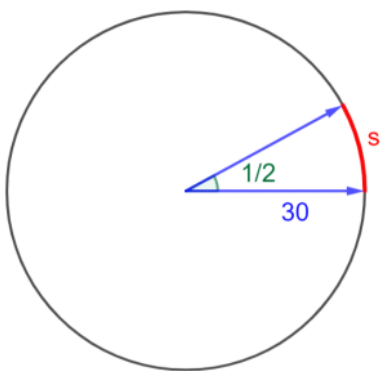
(note: I often may omit saying "in radians" since all angles in AP Precalculus are in radians)



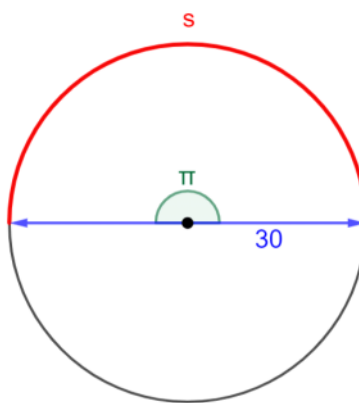
$$\theta = 3$$

Find the arc length subtended by θ

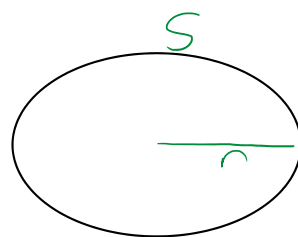
$$S = \theta r$$



$$S = 15$$



$$S = 30\pi$$



Key Thing That You Cannot Not Know

A Full Circle = $360^\circ = 2\pi$ radians

Half a Circle = $180^\circ = \pi$ radians

Quarter Circle = $90^\circ = \frac{\pi}{2}$

$$45^\circ = \frac{\pi}{4}$$

$$60^\circ = \frac{\pi}{3}$$

$$30^\circ = \frac{\pi}{6}$$

$$18^\circ \times \frac{\pi \text{ radians}}{180^\circ} = \frac{18\pi}{180} \text{ radians}$$
$$18^\circ = \frac{\pi}{10} \text{ radians}$$

When you come across some weird angle you don't know

Key Fact: π radian = 180°

From that, you can figure out these next two bits. Memorize if you must.

To convert from degrees to radians:

$$\times \frac{\pi \text{ radians}}{180^\circ}$$

To convert from radians to degrees:

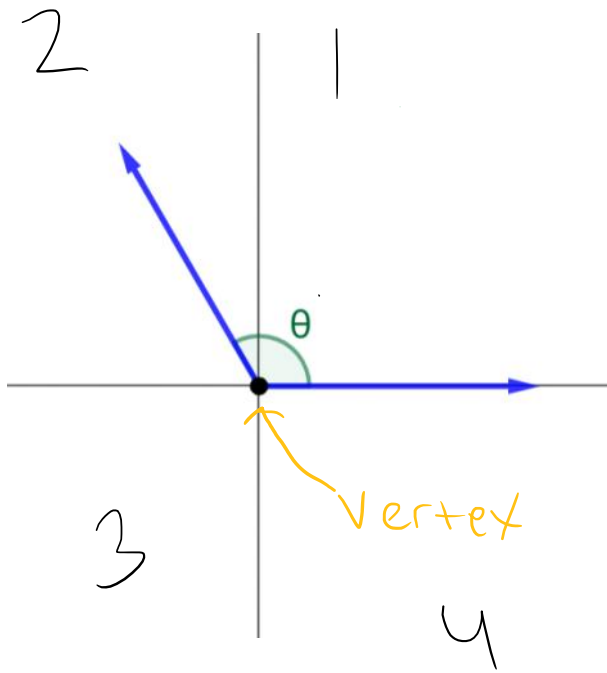
$$\times \frac{180^\circ}{\pi \text{ radians}}$$

Example:

Convert 210° to radians

Convert $\frac{7\pi}{12}$ radians to degrees

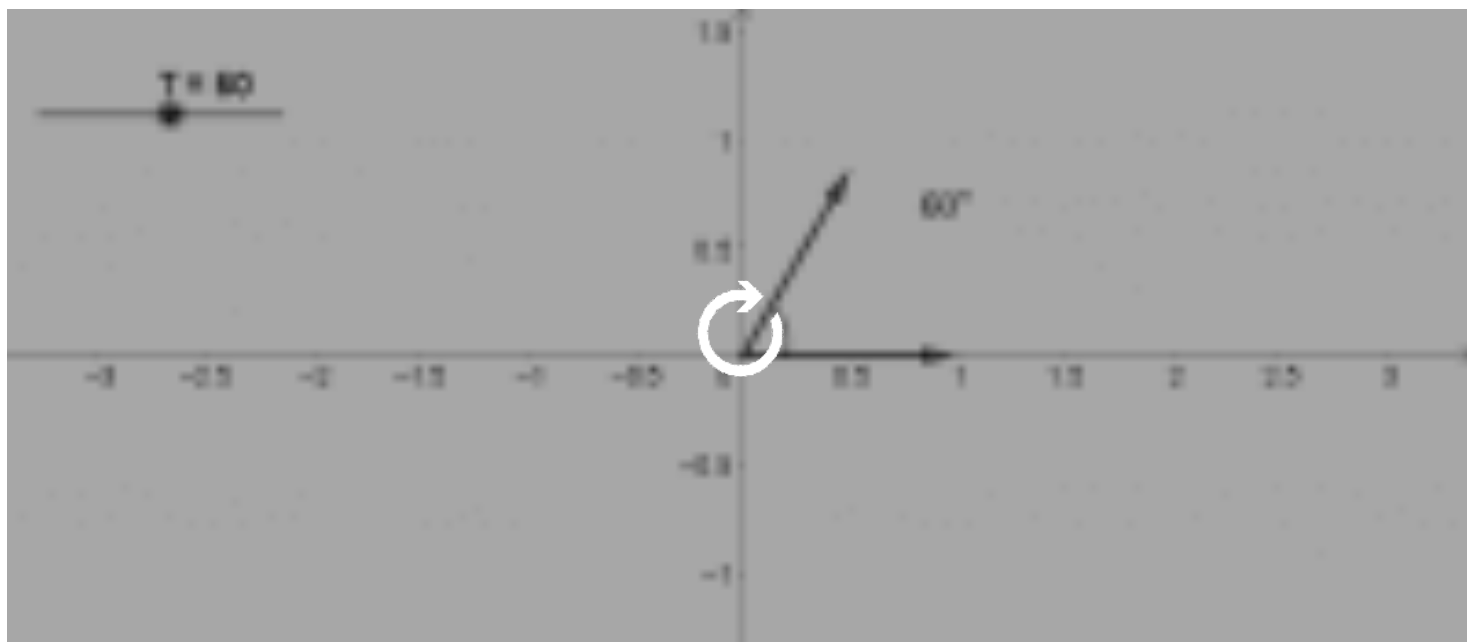
Angles in Standard Position



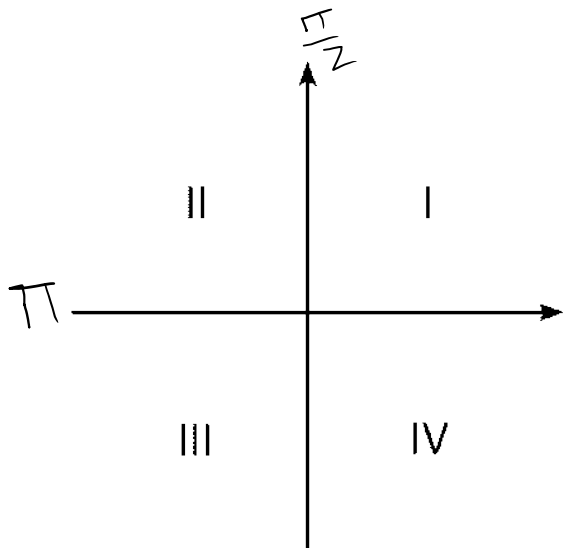
Standard Position:

1. Bendy part of the angle is on the origin (call that bendy part the vertex)
2. One side is on the positive x -axis (call that side the initial ray)
3. Turn counterclockwise (unless negative angle)
4. (ending side is called the terminal ray)

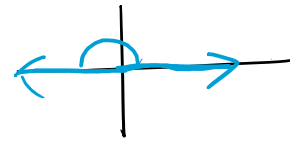
Angle Standard Form



Let's roughly sketch what each angle would look like



180°
A) π



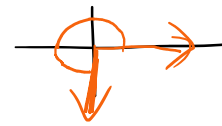
120°
B) $\frac{2\pi}{3}$



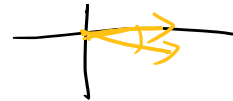
45°
C) $\frac{\pi}{4}$



270°
D) $\frac{3\pi}{2}$

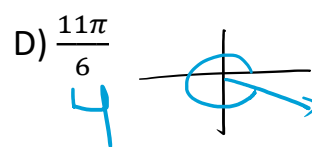
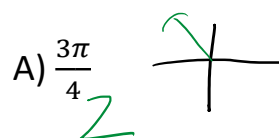
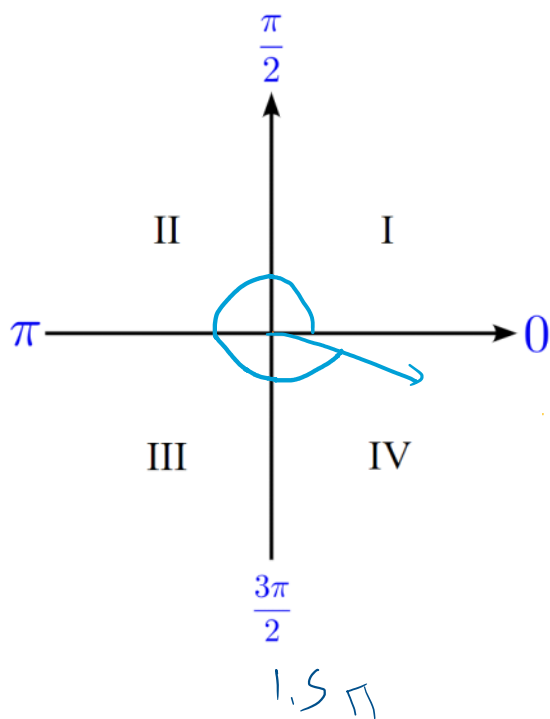


-30°
E) $-\frac{\pi}{6}$

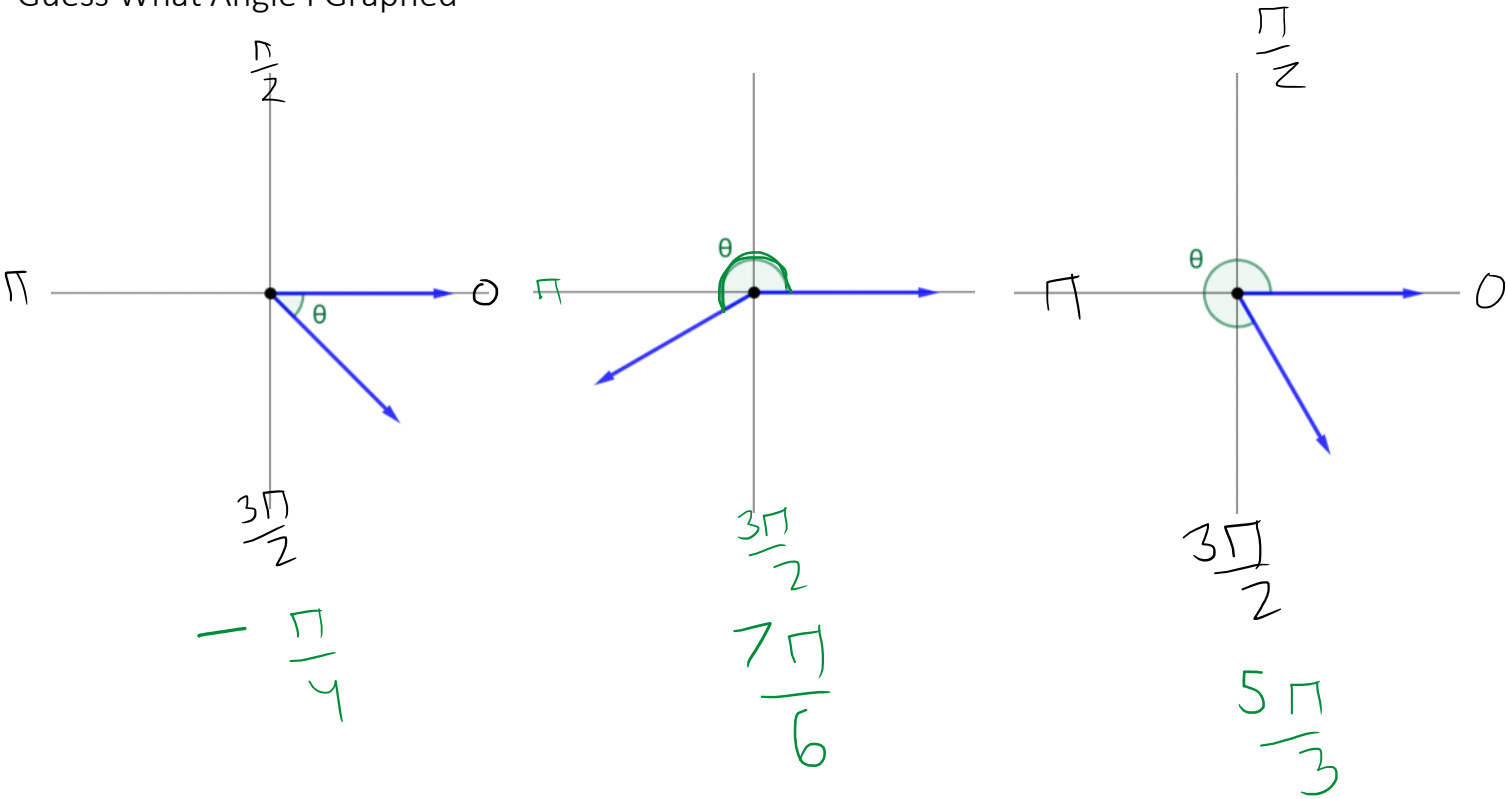


New Vocab Word: "Quadrantal Angle" = An angle for which the terminal side lies on an axis

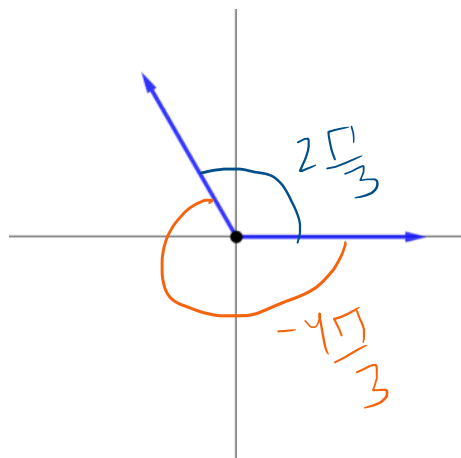
In Which Quadrant Would the Terminal Side of Each Angle Lie?



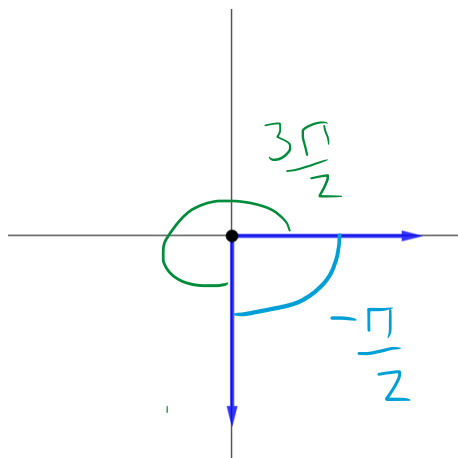
Guess What Angle I Graphed



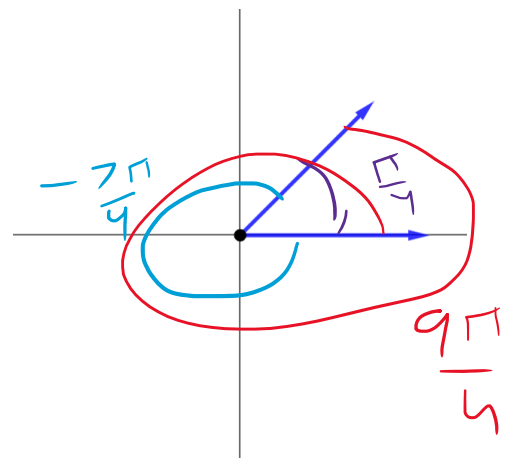
Guess What Angle I Graphed



$$\theta = -\frac{4\pi}{3}$$



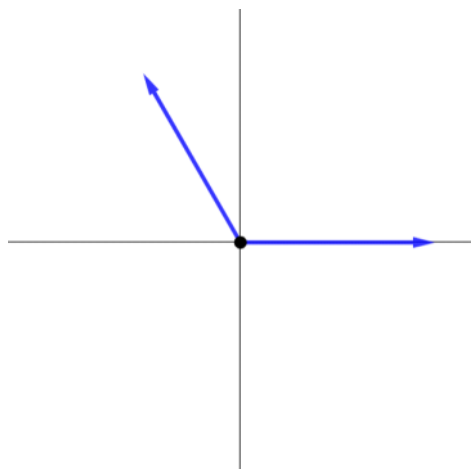
$$\theta = -\frac{\pi}{2}$$



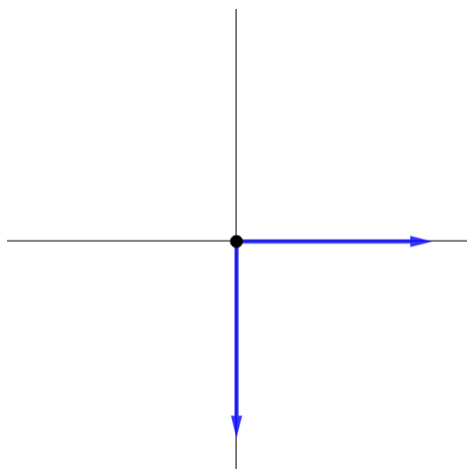
$$\theta = \frac{9\pi}{4}$$

$$2\frac{1}{4}\pi$$

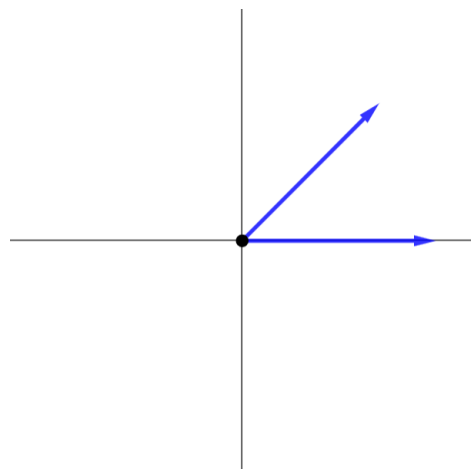
Guess What Angle I Graphed



$$\theta = -\frac{4\pi}{3}$$



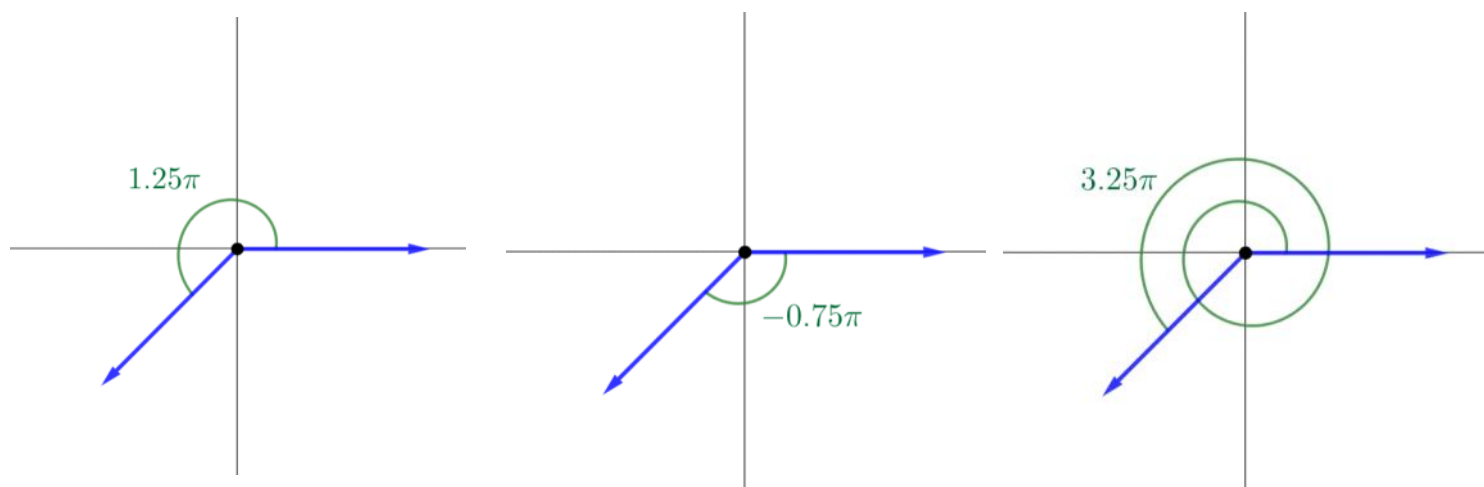
$$\theta = -\frac{\pi}{2}$$



$$\theta = \frac{9\pi}{4}$$

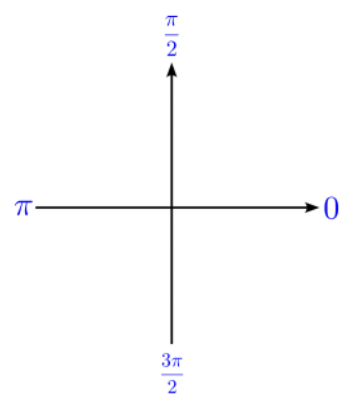
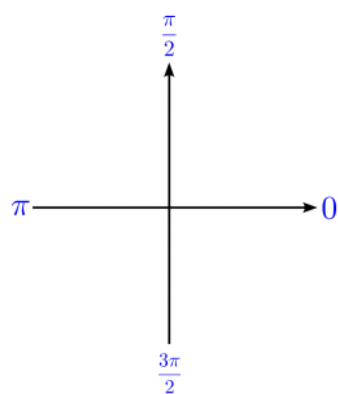
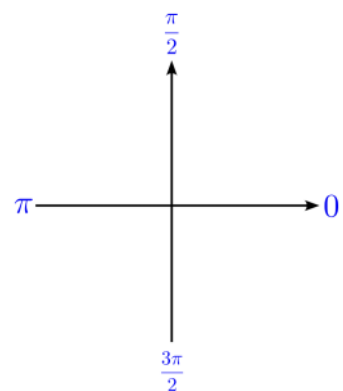
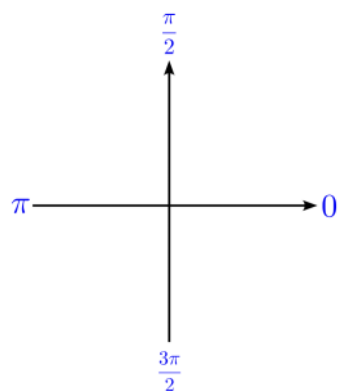
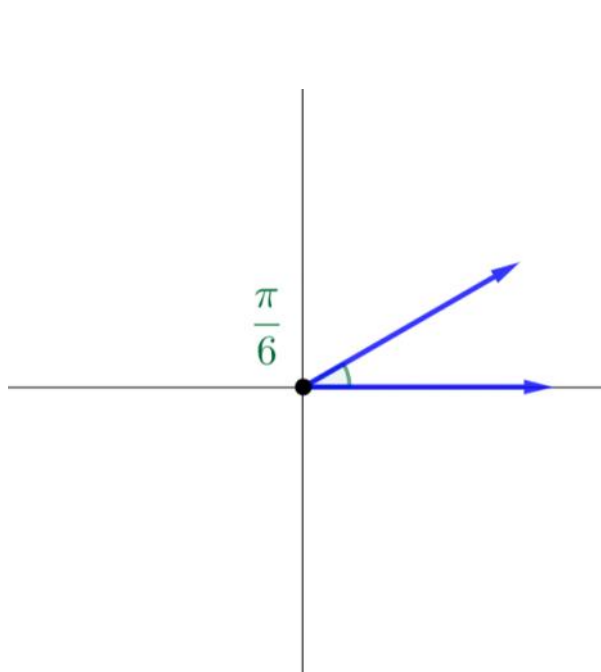
Coterminal Angles

Definition: Two angles with the same initial and terminal sides



Adding or subtracting 2π to an angle produces a coterminal angle

Finding Coterminal Angles: Give one positive and one negative angle coterminal to the given angle



For each of the angles below, give one positive and one negative angle coterminal to the given angle.

A) $\frac{\pi}{2}$

$+2\pi$

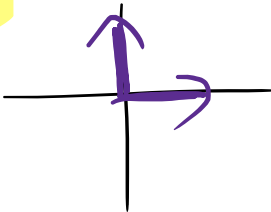
$\frac{5\pi}{2}$

$+2\pi$

$\frac{9\pi}{2}$

-2π

$-\frac{3\pi}{2}$



B) $-\frac{2\pi}{3}$

C) $\frac{7\pi}{8}$

D) $\frac{53\pi}{15}$

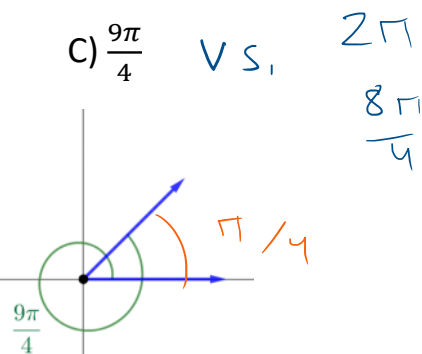
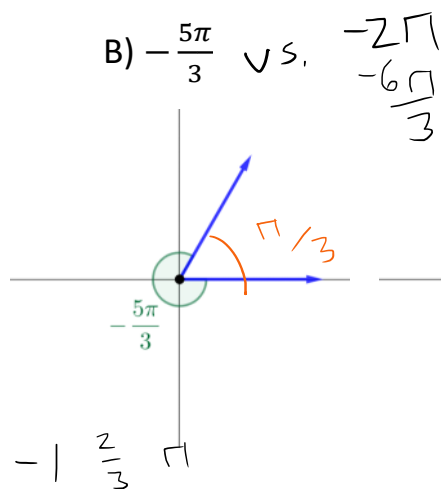
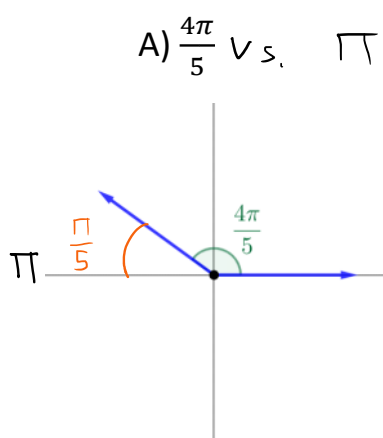
Reference Angles

Reference Angle: A positive acute angle formed by the terminal side of θ and the closest side of the x -axis.

We often label the reference angle as α or θ'

<https://editor.p5js.org/ari.novick5/present/kPL-JNxeB>

Find the reference angle for each of the following:



$$-2\pi < -5\frac{\pi}{3} < -\pi$$

$$2\pi < \frac{9\pi}{4} < 3\pi$$

$$2\frac{1}{4}\pi$$

Find the reference angle for each of the following

D) $\frac{17\pi}{10}$ vs. $\frac{20\pi}{10}$

$\frac{10\pi}{10} < \frac{17\pi}{10} < \frac{20\pi}{10}$
 $\frac{3\pi}{10}$

E) $-\frac{\pi}{3}$

$\frac{\pi}{3}$

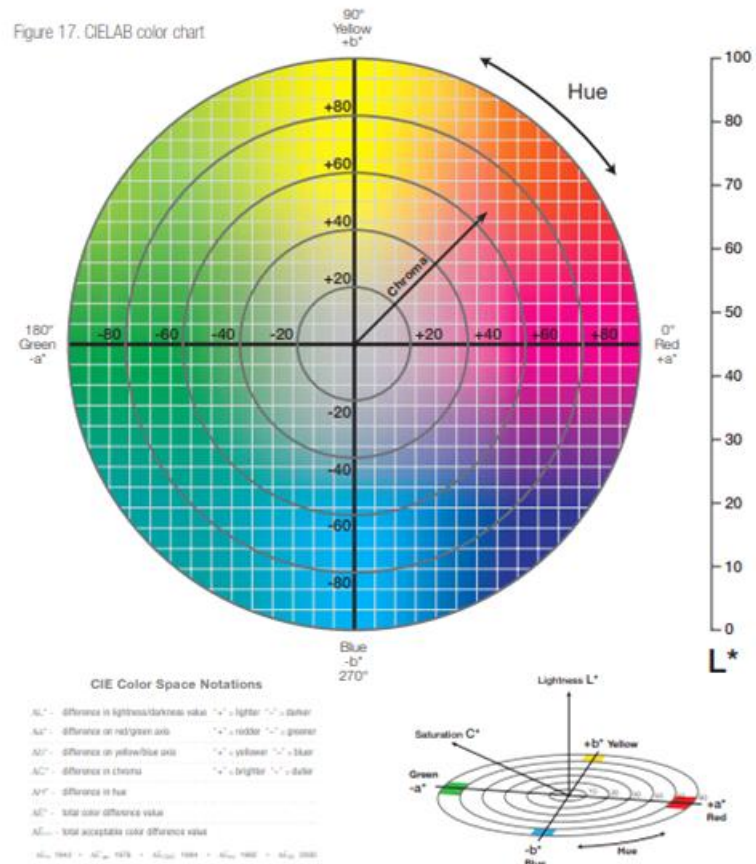
F) $\frac{7\pi}{6}$

$\frac{6\pi}{6} < \frac{7\pi}{6} < \frac{12\pi}{6}$
 $\frac{\pi}{6}$

G) $\frac{2\pi}{3}$

$\frac{0\pi}{3} < \frac{2\pi}{3} < \frac{3\pi}{3}$
 $\frac{\pi}{3}$

Color Theory: CIE L*a*b* Color Space



The Vocab We Mastered Today

- Radian
- Initial Side
- Terminal Side
- Vertex
- Angle in Standard Position
- Coterminal
- Reference Angle