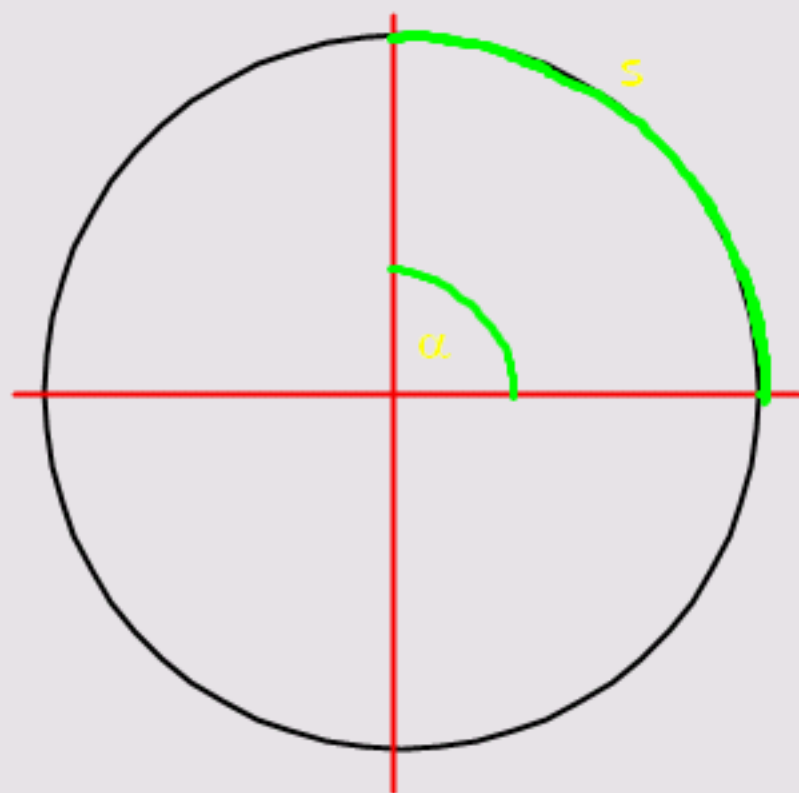


6.1--Angles and Radian Measure

The RADIAN measure of an angle in the unit circle is the length of the corresponding arc...it is a linear measure as opposed to an angular measure.

We use it when we need a linear measure



the radian measure of angle α is s , the length of the corresponding arc

radian measure = arc length

NOTE: If $r \neq 1$ (not in unit circle), then

$$\alpha = \frac{\text{arc length}}{\text{radius length}}$$

$$\alpha = \frac{s}{r} \text{ or } s = \alpha r$$

NOTICE: $C = 2\pi r$ (for any circle, right?)

in unit circle, $r = 1$so $C = 2\pi(1) = 2\pi$

This means $360^\circ = 2\pi$ rads (1 complete revolution)
~6.28 rads

so $180^\circ = 1\pi$ rads

Therefore $\frac{180^\circ}{\pi} = 1$ radian (1 rad ~57.3 $^\circ$)

So to convert radian measure to degree measure, just multiply by $\frac{180^\circ}{\pi}$

Example: Convert to degrees $\frac{\pi}{3}$

$$\frac{\pi}{3} \times \frac{180^\circ}{\pi} = 60^\circ$$

UDO: Convert each radian measure to degree measure

NOTE: Be sure to indicate degree measure with the "°"

1. $\frac{3\pi}{2}$

2. $\frac{\pi}{2}$

3. $\frac{\pi}{6}$

4. 6.14

NOTE: radian measure doesn't ALWAYS have a π in it!

Also, from $180^\circ = 1\pi$ rads

we have $1^\circ = \frac{\pi}{180}$ rads (divide both sides by 180°)

So to convert degree measure to radian measure, multiply by $\frac{\pi}{180}$

Example: Convert to radians: 60°

$$60 \times \frac{\pi}{180} = \frac{60\pi}{180} = \frac{\pi}{3}$$

Note: radian
measures don't
always have π in them!

Example: Convert to degrees: 1.25 rads

$$1.25 \times \frac{180}{\pi} = 71.6^\circ$$

UDO:

Convert the following angle measures to radian measure:

1. 45°

2. 120°

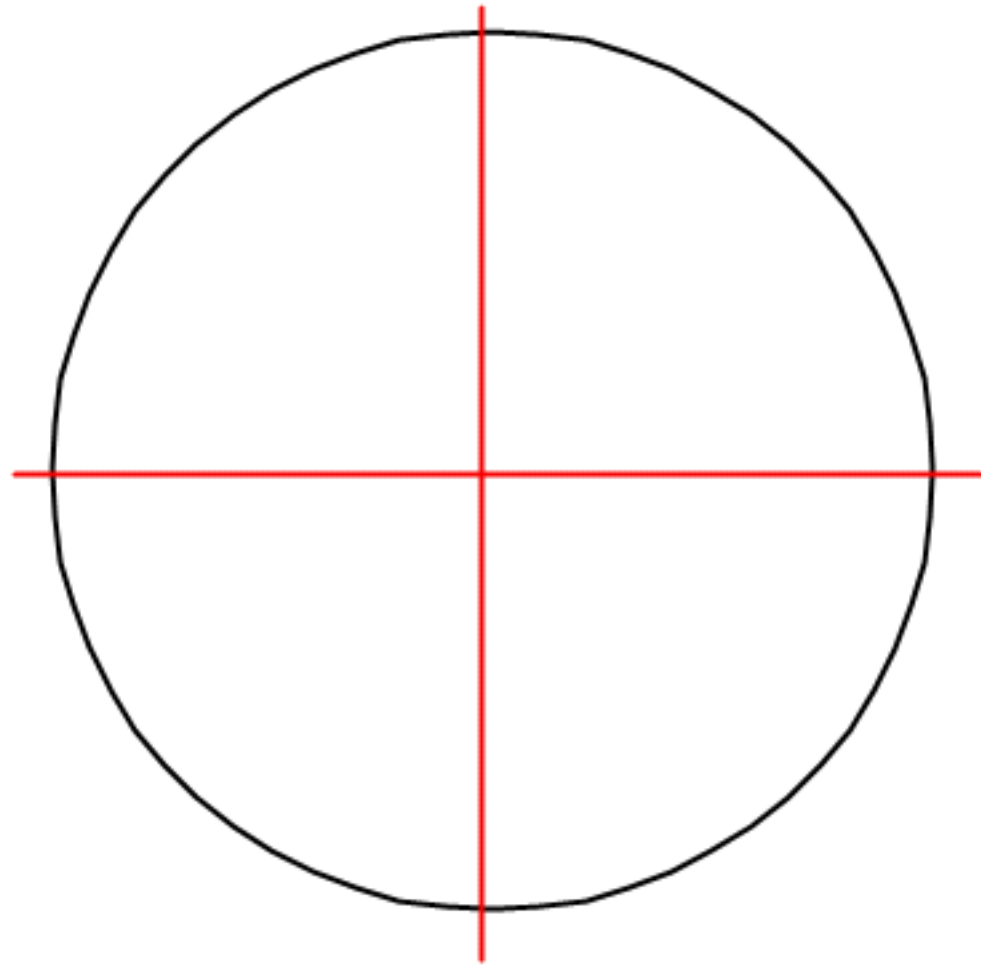
3. 150° (there it is!)

4. 330°

5. 135°

6. 315°

You've learned the unit circle in degree measure. You now must learn it in radian measure!



Practice drawing the unit circle in radian mode...now!

draw multiples of $\pi/3$ and $\pi/4$ and $\pi/6$

You should be able to:

Give all angles **coterminal** with $\pi/3$

Give the **reference angle** for $5\pi/6$

Give the **reference angle** for $7\pi/4$

Give the **reference angle** for $4\pi/3$

Give the **reference angle** for $7\pi/3$

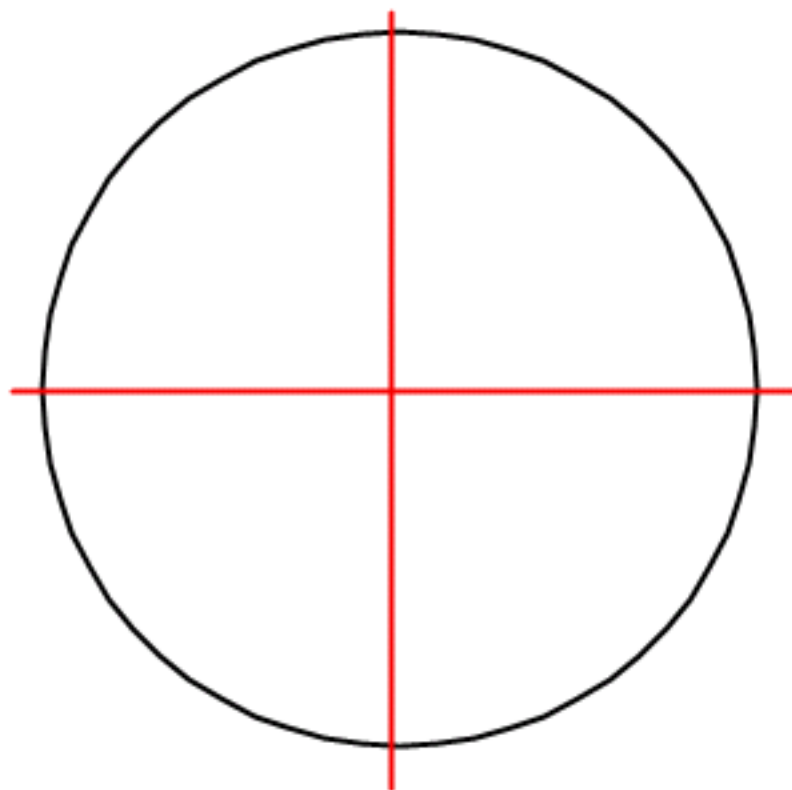
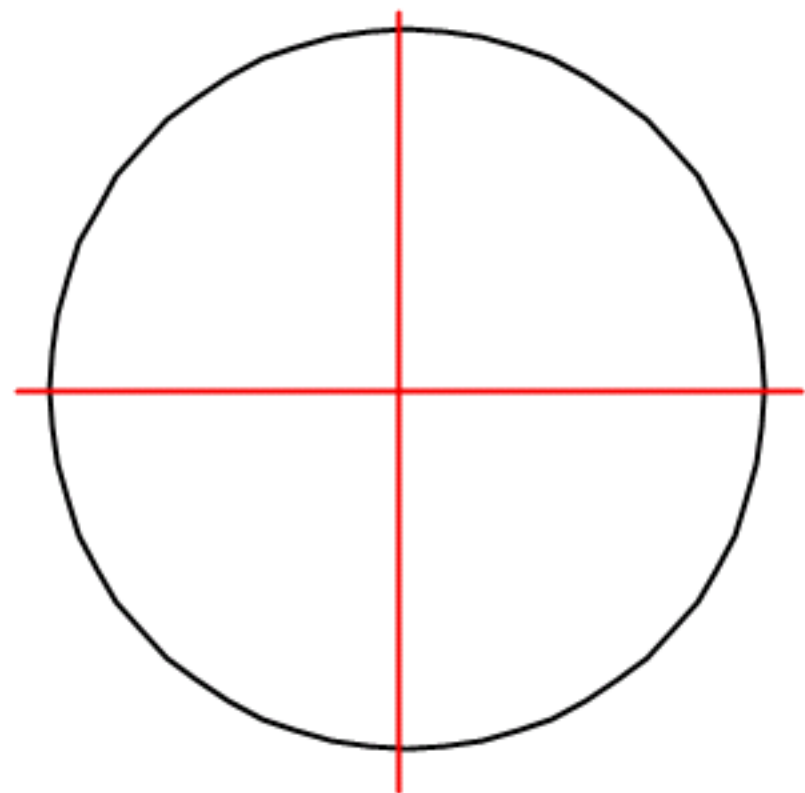
Give the **reference angle** for $15\pi/4$

Evaluate:

1. $\cos \frac{5\pi}{4}$

2. $\cot \frac{2\pi}{3}$

3. $\sin \frac{11\pi}{6}$



Evaluate:

1. $\sec(-5\pi)$

2. $\sin \frac{17\pi}{6}$

3. $\csc \frac{11\pi}{4}$

Evaluate:

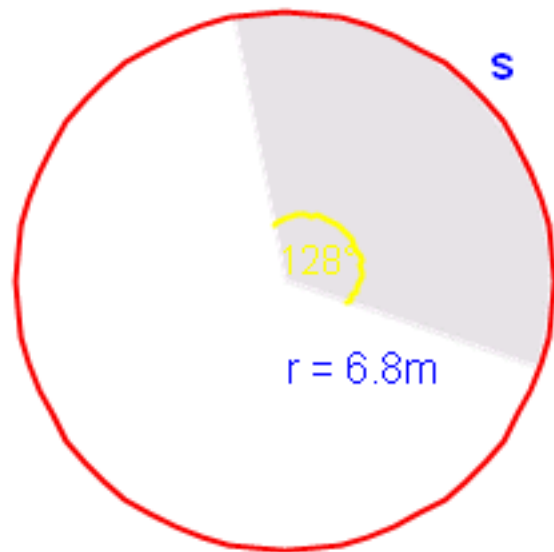
1. $\sec(19\pi/6)$

2. $\cot(25\pi/4)$

If not in unit circle, to find the length of an arc, s : $s = r\theta$, where θ is measured in radians

To find the area of a sector of a circle: $A = \frac{1}{2}r^2\theta$, where θ is measure in radians

Examples:



$$s = 6.8(128^\circ)(\pi/180)$$

$$s = 15.19 \text{ m}$$

$$A = \frac{1}{2} (6.8)^2(128^\circ)(\pi/180)$$

$$A = 51.65 \text{ m}^2$$