4.1 Angles

Radians vs. Degrees

alpha

theta

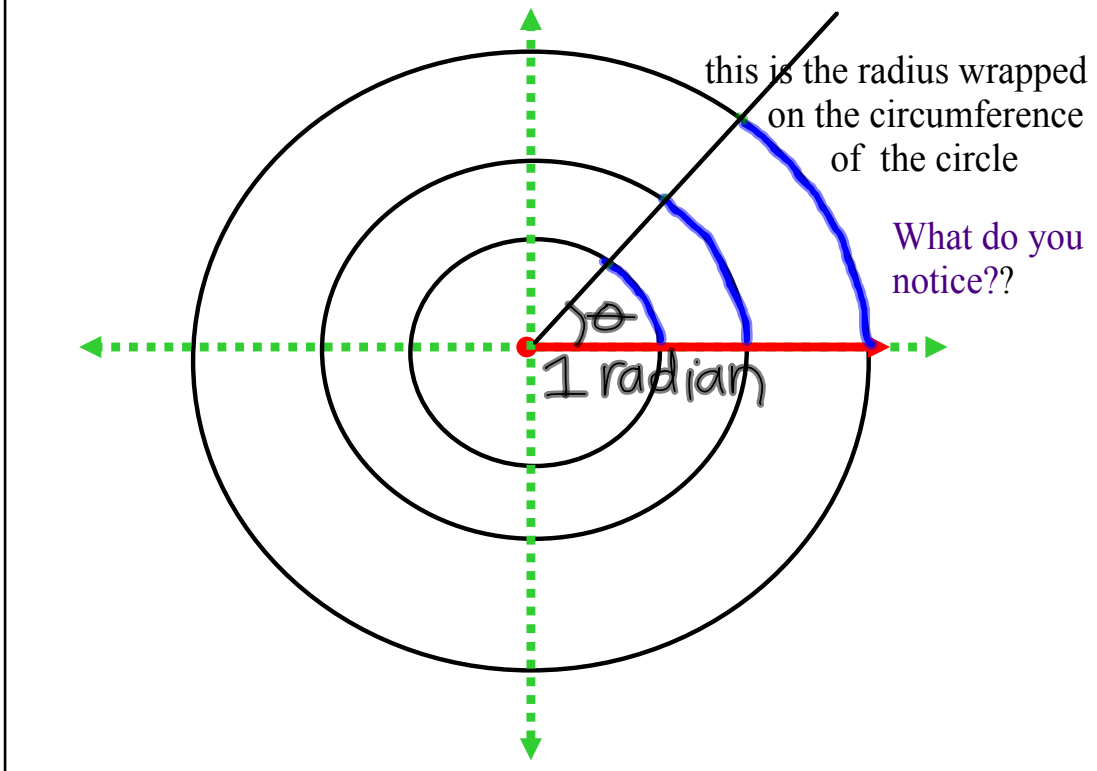
angles are usually named with Greek letters θ, α, β for example

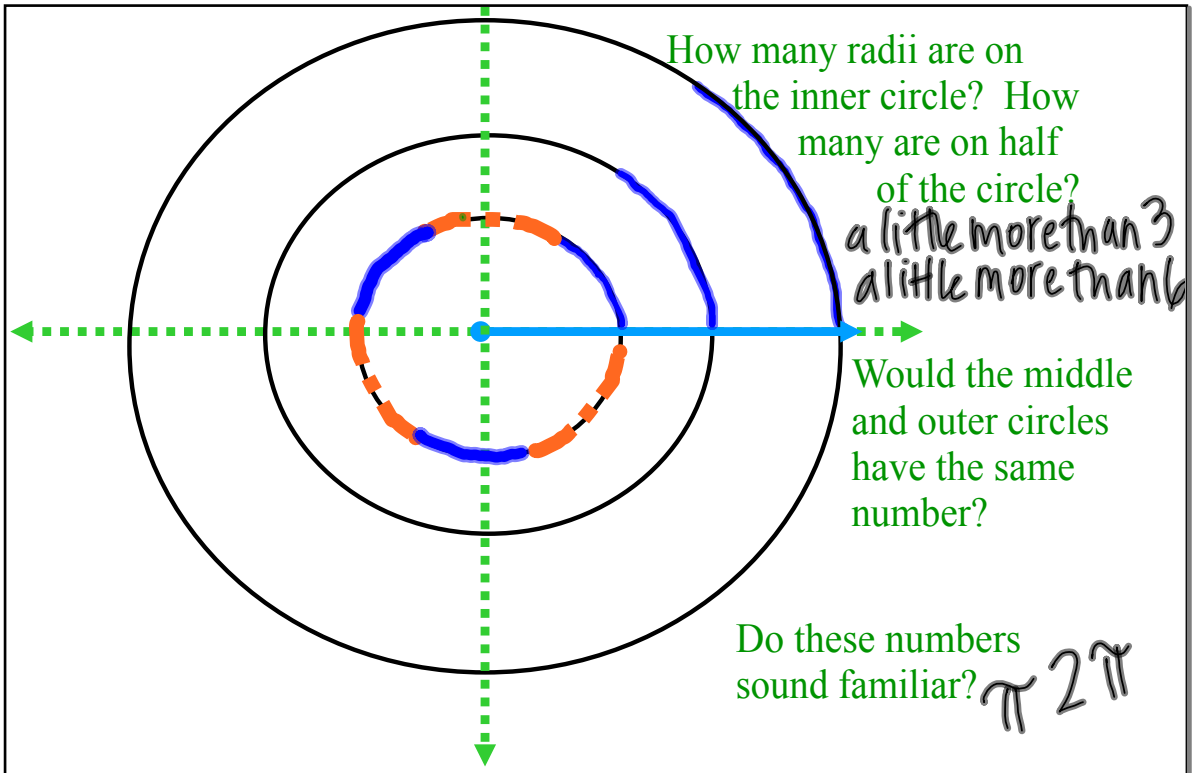
Beta

there are 2 units used to measure angles:

degrees: 360^o in a circle

radians: 2π





4.1 Angles

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Radians vs. Degrees

angles are usually named with Greek letters θ, α, β for example

there are 2 units used to measure angles:

degrees: 360^o in a circle

radians:

What is a radian?

A central angle of a circle has a measure of 1 RADIAN if it intercepts an arc with the same length as the radius

How many degrees are in half a circle? How many degrees are in π?

$180^\circ \cong \pi$

What ratio do I use to convert between degree and radian angle measures?

$\frac{180^\circ}{\pi}\ \frac{\pi}{180^\circ}\ \frac{360^\circ}{2\pi}\ \frac{2\pi}{360^\circ}$

Examples:

$(\text{rad})\frac{^\circ}{\text{rad}}\ \frac{\text{rad}}{^\circ}$

Convert to degrees:

$2\pi/3$ $\quad \frac{2\pi}{3}\cdot\frac{180^\circ}{\pi} = \frac{360^\circ}{3} = 120^\circ$

$5\pi/4$ $\quad \frac{5\pi}{4}\cdot\frac{180^\circ}{\pi} = \frac{900^\circ}{4} = 225^\circ$

$(3\text{rad})\frac{180^\circ}{\pi} = \frac{3\cdot 180^\circ}{\pi}$

$\frac{540^\circ}{\pi} \approx 171.8^\circ$

Convert to radians:

150° $\quad \frac{\pi}{180^\circ} = \frac{150\pi}{180} = \frac{5\pi}{6}$

315° $\quad \frac{\pi}{180^\circ} = \frac{315\pi}{180} = \frac{7\pi}{4}$

Work on 9-22 on HW

Arc Length

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$$C = r(2\pi)$$

Circumference — radius — # of radians in an entire circle

Since radians are related to arc length we can use the circumference formula to help us find arc length

$$C = r(2\pi)$$

Replace with s (arc length) — radius (doesn't change) — Replace with # of radians in your arc

$$s = r\theta$$

when s is the arc length and θ is the angle measured in radians

Arc Length (back)

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Arc length formula using degrees

$$s = r\theta$$

θ is supposed to be in radians, if θ is degrees how do you convert from degrees to radians?

Examples: $S = r\theta$

use the appropriate arc length formula to find the missing information

s	r	θ
?	2 in	25 rad.

$S = 2(25) = 50$

s	r	θ
40 cm	?	$20° \frac{\pi}{180°} = \frac{20\pi}{180} = \frac{\pi}{9}$

$\left(\frac{9}{\pi}\right)40 = r\left(\frac{\pi}{9}\right)\left(\frac{9}{\pi}\right)$

$\frac{360}{\pi} = r$

DMS Degrees, Minutes and Seconds

A degree is a unit of angular measure equal to 1/180th of a straight angle. In DMS each degree is subdivided into 60 minutes (') and each minute is subdivided into 60 seconds (").

a) convert $37.425°$ degrees to DMS

$37° \quad .425(60') = 25.5' \quad .5(60) = 30''$

$37°25'30''$

b) convert $42°24'36''$ to degrees

$42° + \frac{24°}{60} + \frac{36°}{3600} = 42.41°$