

4.1 Angles

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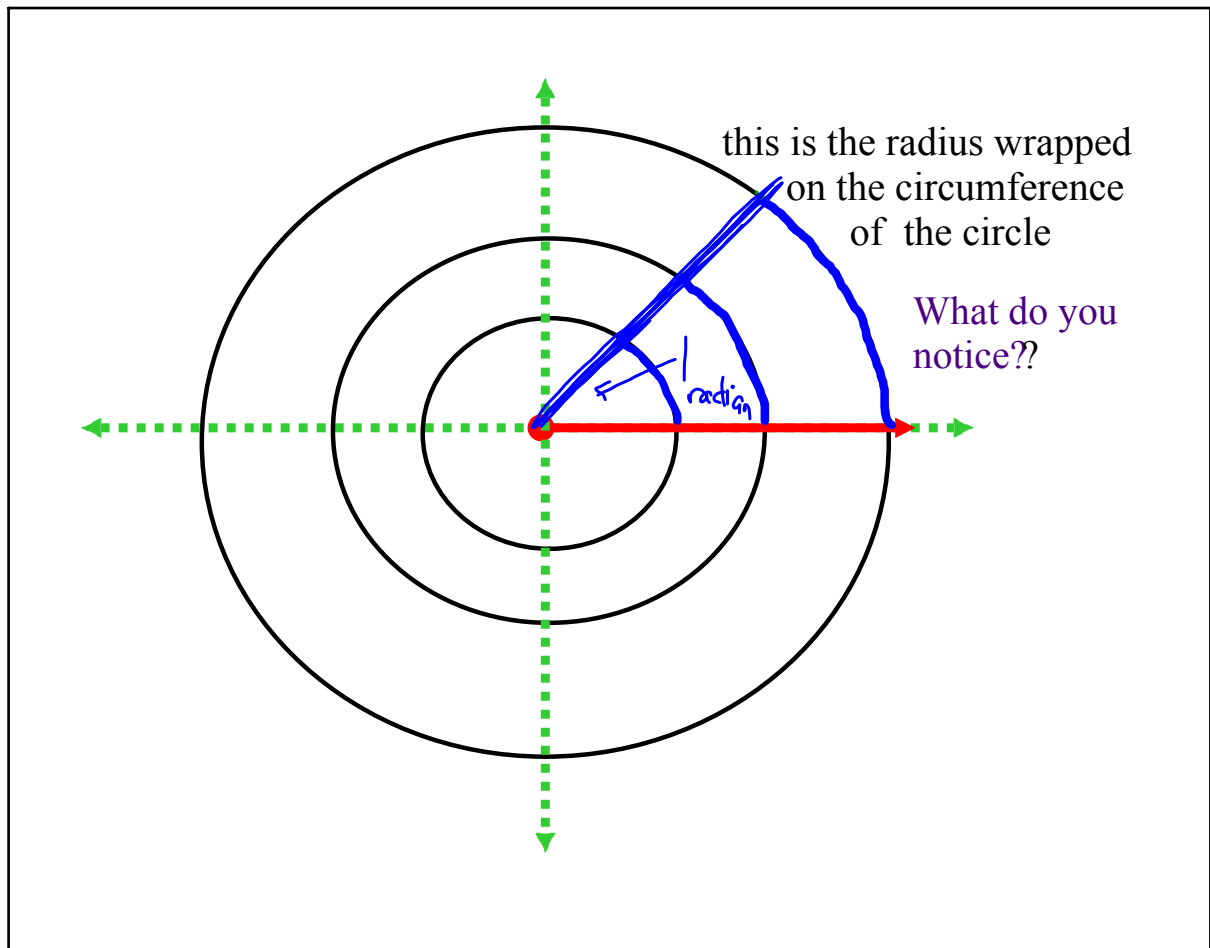
Radians vs. Degrees

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

there are 2 units used to measure angles:

degrees: 360° in a circle

radians: the size of angle created by laying radii along the edge of a circle



How many radii are on the inner circle? How many are on half of the circle?

Would the middle and outer circles have the same number?

Do these numbers sound familiar?

$C = r(2\pi)$

$C = 5(2\pi)$

$\frac{C}{d} = \pi$

Handwritten notes on the diagram include: 3.14 radii in $\frac{1}{2}$ circle, 5 in, and π .

Examples:

$180^\circ = \pi$

Convert to degrees:

$2\pi/3$ $\frac{2\pi}{3} \times \frac{180^\circ}{\pi \text{ rad.}} = 120^\circ$

$5\pi/4$ $\frac{5(180)}{4} = 5(45) = 225^\circ$

Convert to radians:

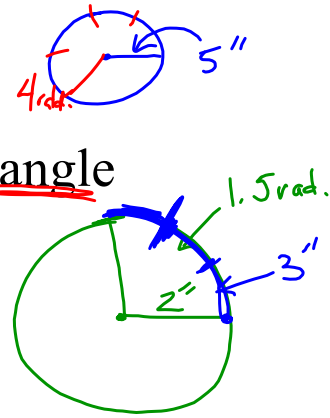
150° $\frac{150}{180} \times \pi \text{ rad.} = \frac{5\pi}{6}$

315° $\frac{315}{180} \times \pi = \frac{35\pi}{20} = \frac{7\pi}{4}$

What is a radian?

related to arc length - so $s = r\theta$
 when s is the arc length and θ is the angle
measured in radians

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



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

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

Arc Length

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

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

Examples:

use the appropriate arc length formula to find the missing information

$$\begin{matrix} \textcircled{s} \\ ? \\ 50'' \end{matrix} = \begin{matrix} \textcircled{r} \\ 2 \text{ in} \end{matrix} \cdot \begin{matrix} \textcircled{\theta} \\ 25 \text{ rad.} \end{matrix}$$

40 cm

?

$$\frac{20^\circ}{180^\circ} \cdot \pi = \frac{\pi}{9}$$

$$\frac{9}{\pi} \cdot 40 \text{ cm} = r \cdot \frac{\pi}{9}$$

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

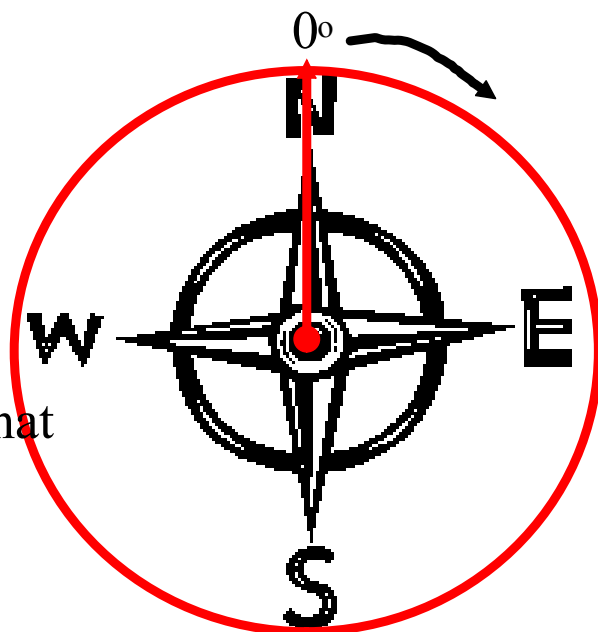
Bearings

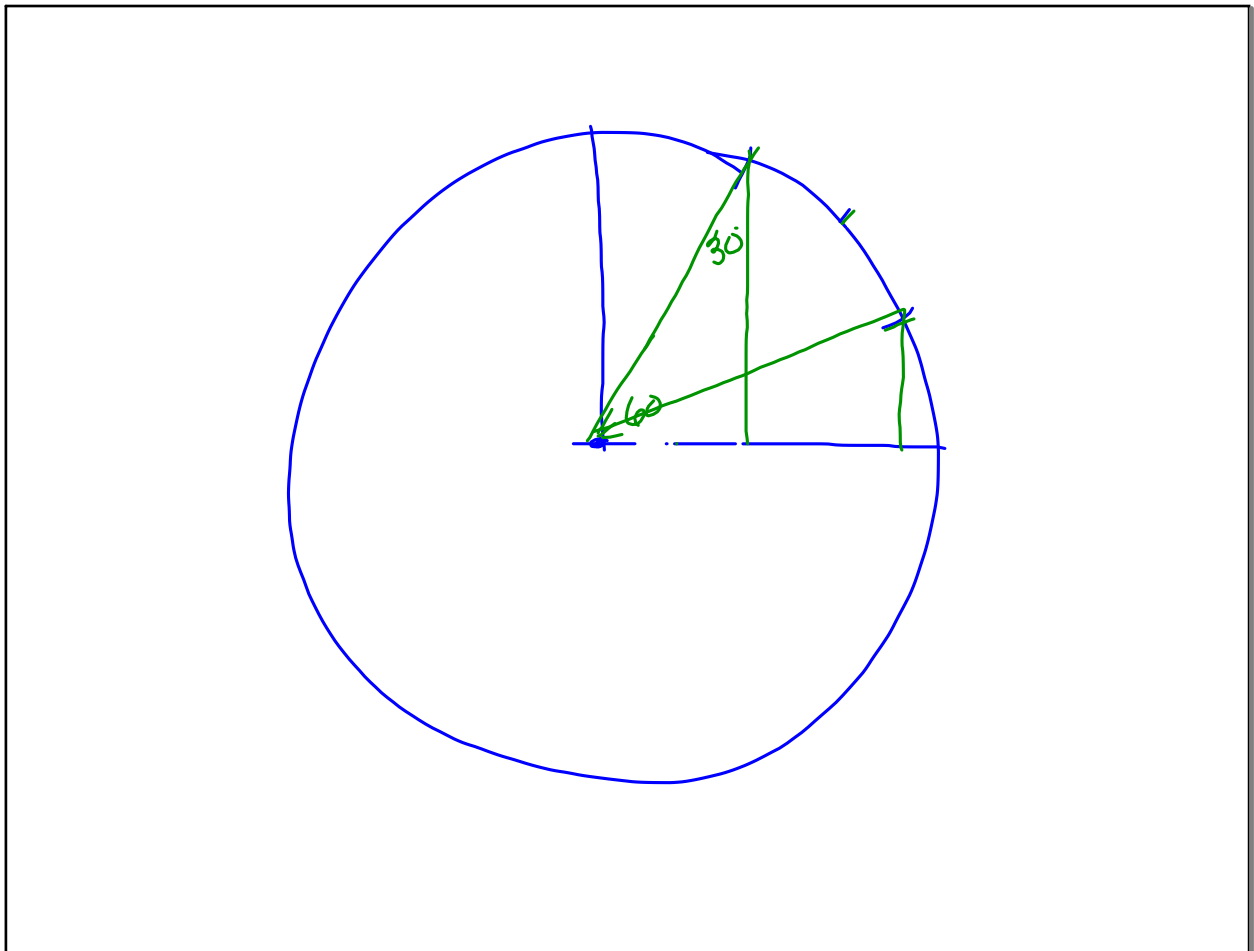
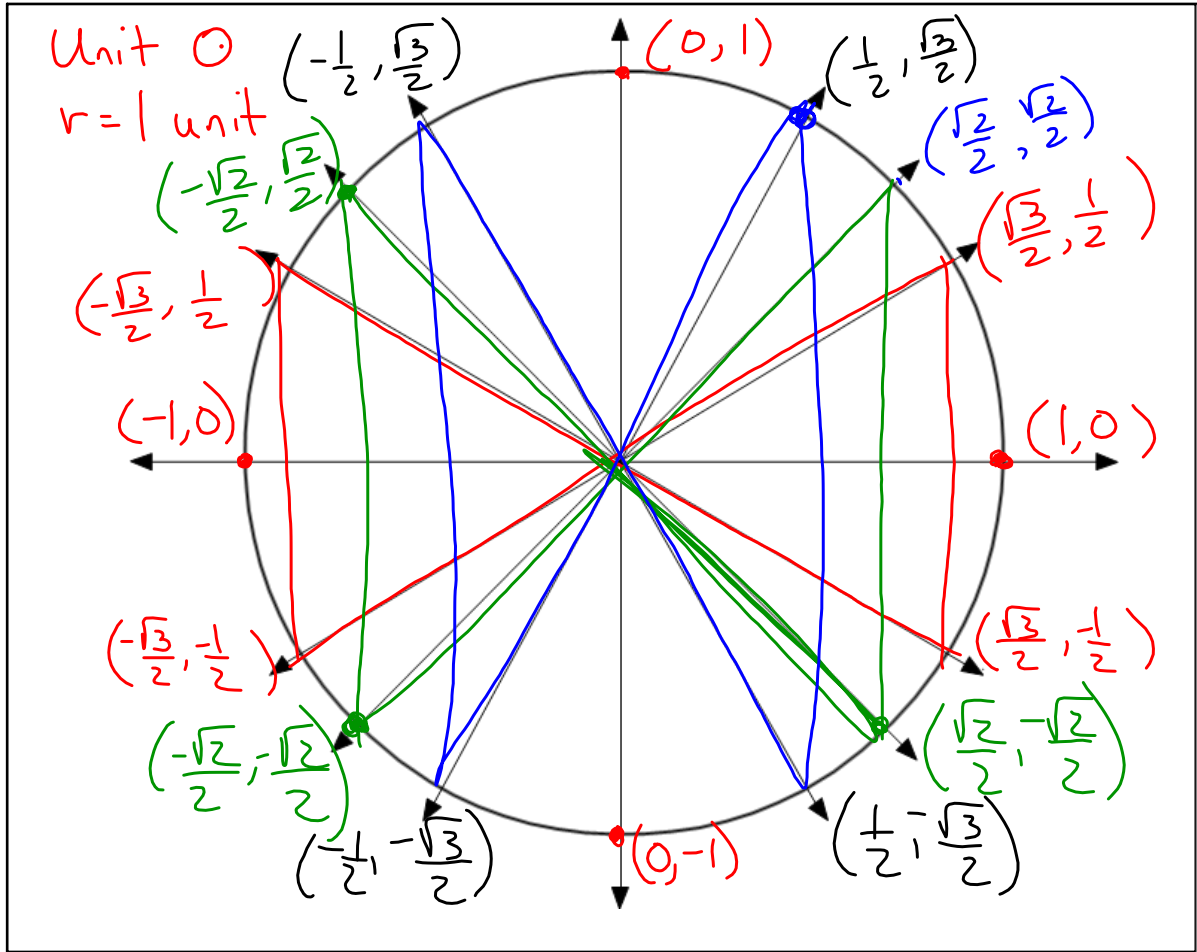
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measured from North
clockwise

if you are headed due
east what is your
bearing?

if you are headed SW what
is your bearing?



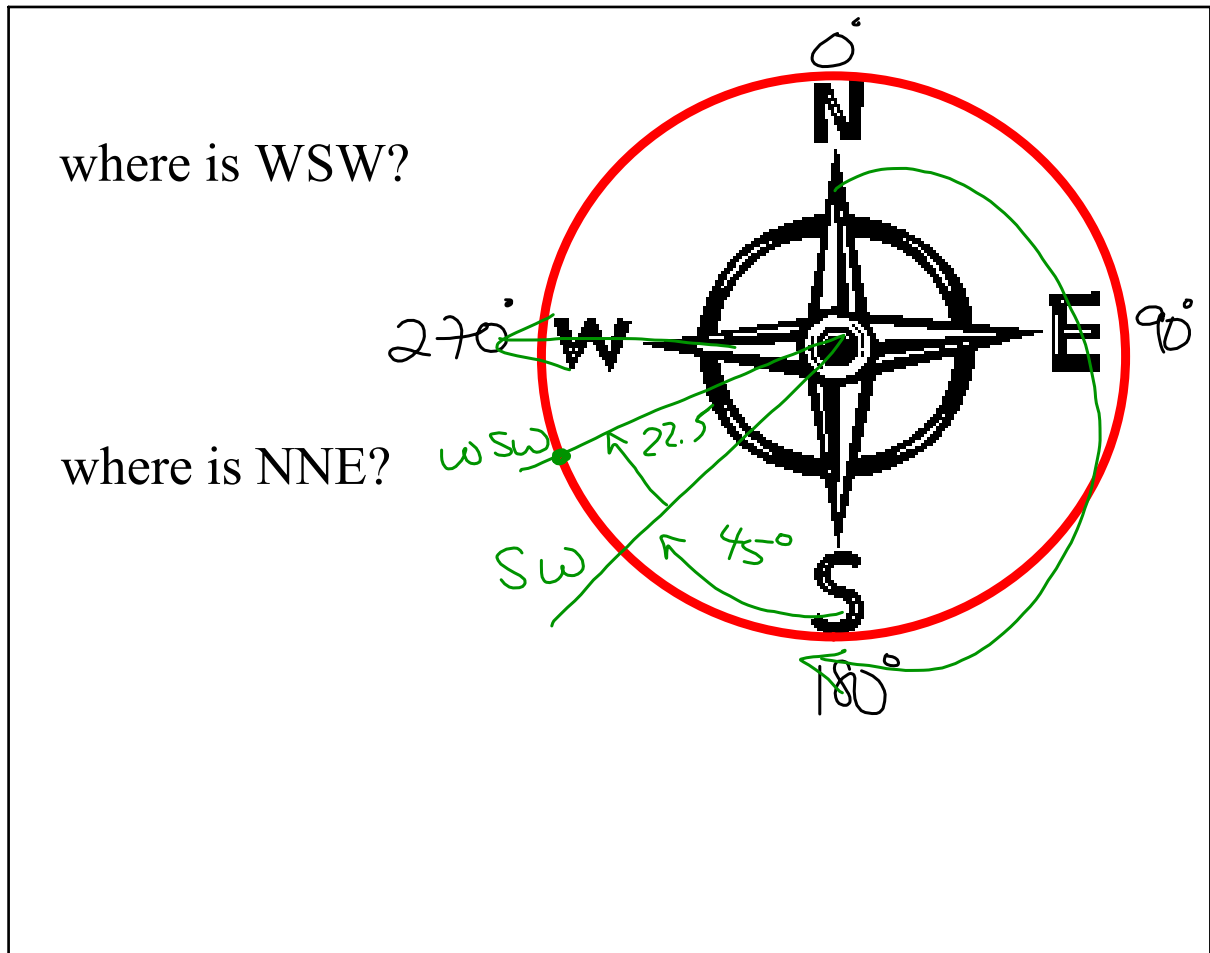


30 - 60 - 90
 1 : : 2
 $x : x\sqrt{3} : 2x$

10, 12, 2, 1
 5, 6, 1, $\frac{1}{2}$
 7

45 - 45 - 90
 $x \quad x \quad x\sqrt{2}$
 $1 \quad 1 \quad \sqrt{2}$

$\frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$



Angular Motion: Unit Conversions

$$1 \text{ revolution} = 360^\circ = 2\pi$$

A bicycle with 26" diameter wheels is traveling at 10 miles per hour. How many revolutions does each wheel make per minute?