Homework grades this week:

01: Sign up for Khan Academy with coach code 4CG5S2.

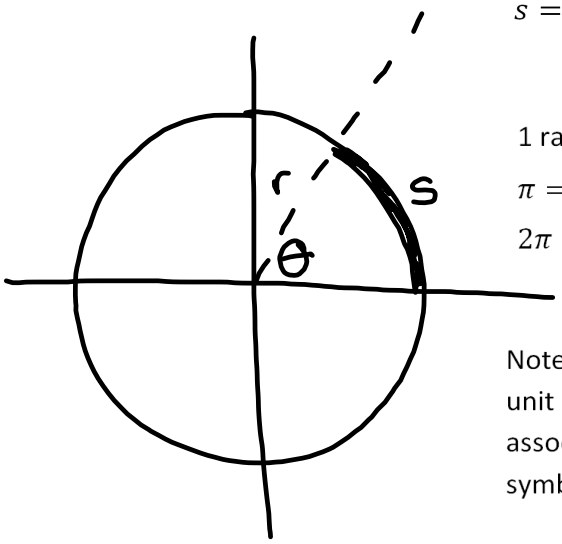
02: Read sections 5.1 and 5.2 in your textbook and complete at least 45 minutes of exercises on Khan Academy on related topics (outside of class); in addition, complete "Mastery Challenges" as often as they become available to you.

03: Textbook problems from section 5.1 #1, 2, 7-18 all, 31-74 all. This will mostly be completed in class and will be due this Friday. See syllabus for proper formatting of written homework assignments.

Khan Academy exercises to work on:

- arc measure
- arc length
- radians & degrees
- radians & arc length
- complementary & supplementary angles
- multiple units word problems
- convert units (metrics)
- convert units word problems (metrics)
- convert units (US customary)
- convert units word problems (US customary)

What is a radian?



r = radius length

s = arc length

1 radian $\approx 57.3°$

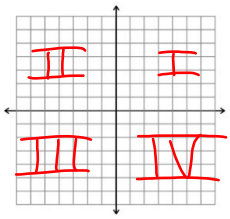
$\pi = 180°$

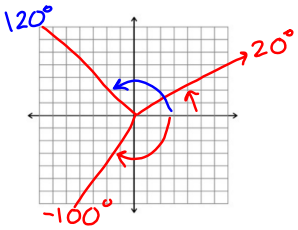
$2\pi = 360°$

When $s = r$, we say that the corresponding angle θ which is subtended by arc s has measure 1 radian.

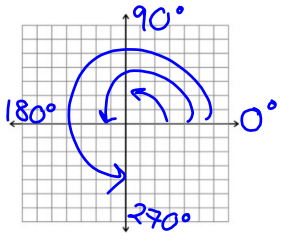
Note that θ is independent of the radius length and any unit of measurement. Therefore radians have no associated units, and any angle measure without a degree symbol is assumed to be in radians.

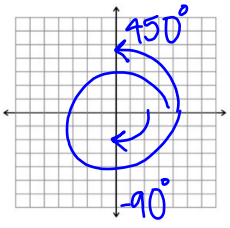
The coordinate plane is divided into four quadrants.



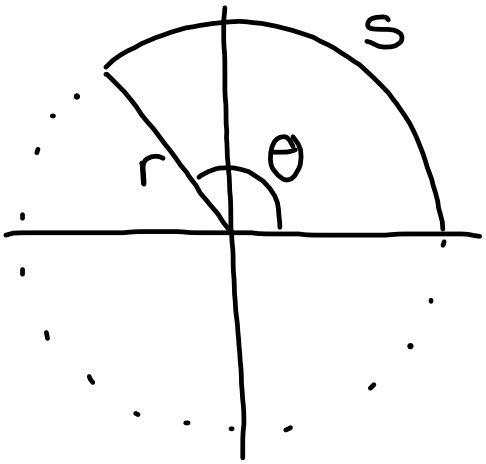


An angle whose terminal side falls on an axis is called a quadrantal angle.





Arc Length & Angular Speed



Arc Length

r = radius or distance from the center of rotation $(in, cm, km, etc.)$

s = arc length or distance traveled along the circumference of a circle $(in, cm, km, etc.)$

θ = angle or amount of rotation $(deg, rad, revolutions, etc.)$

$$\boxed{s = r\theta}$$

1. $r = 5in$; $\theta = 45°$; $s = ?\, in$

$s = r\theta$

$s = \frac{5\,in}{1} \cdot \frac{45^\circ}{1} \cdot \frac{\pi}{180^\circ} = \frac{5\pi}{4}\,in$

2. $s = 16yards$; $\theta = 5$; $r = ?\, yards$

$r = \frac{s}{\theta} = \frac{16\ yards}{5} = \frac{16}{5}\ yards$

3. Find the measure of a rotation in radians when a point 2 meters from the center of rotation travels 4 meters.

$r = 2m$; $\theta = ?$; $s = 4m$

$\frac{s}{r} = \frac{r\theta}{r}$

$\theta = \frac{s}{r} = \frac{4m}{2m} = 2$

Linear Speed

$v = \frac{s}{t}$

Angular Speed

$\omega = \frac{\theta}{t}$ ω = omega

Arc Length

$s = r\theta$

$v = r\omega$

Relating Linear & Angular Speed

$v = \frac{s}{t} = \frac{r\theta}{t} = r \cdot \frac{\theta}{t} = r\omega$

r = radius or distance from the center of rotation $(in, cm, km, etc.)$

s = arc length or linear distance along the circumference of a circle $(in, cm, km, etc.)$

θ = angle or amount of rotation $(deg, rad, revolutions, etc.)$

t = time $(sec, min, hours, years, etc.)$

$v = \frac{\text{linear distance}}{\text{time}}$ = linear speed $\left(\frac{km}{s}, \frac{mi}{h}, etc.\right)$

$\omega = \frac{\text{amount of rotation}}{\text{time}}$ = angular speed $\left(\frac{rev}{min}, \frac{deg}{s}, etc.\right)$

1. A wheel with a 15 inch diameter rotates at a rate of 6 radians per second. What is the linear speed of a point on its rim in feet per minute?

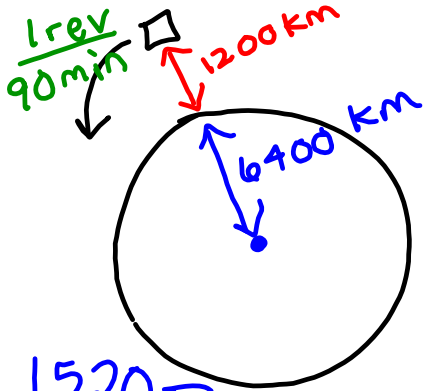
$r = \frac{15\text{ in}}{2}$; $\omega = \frac{6\text{ rad}}{5}$; $V = ?\ \frac{ft}{min}$

$V = r\omega$

$V = \frac{15\text{ in}}{2} \cdot \frac{6\text{ rad}}{5} \cdot \frac{1\text{ ft}}{12\text{ in}} \cdot \frac{60}{1\text{ min}}$

$= 225\text{ ft/min}$

2. An earth satellite in circular orbit 1200 km high makes one complete revolution every 90 minutes. What is its linear speed in km/min, given that the earth's radius is 6400 km?



$V = ?\ \frac{km}{min}$; $r = 1200 + 6400$

$r = 7600\text{ km}$

$\omega = \frac{1\text{ rev}}{90\text{ min}}$

$V = r\omega$

$= \frac{7600\text{ km}}{1} \cdot \frac{1\text{ rev}}{90\text{ min}} \cdot \frac{2\pi}{1\text{ rev}} = \frac{1520\pi}{9}\text{ km/min}$