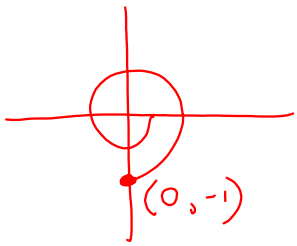
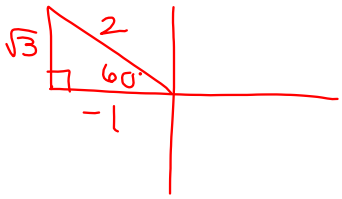
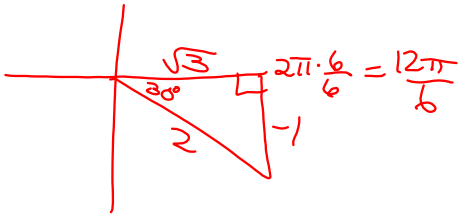
Evaluate the following:

1. $\sin 135°$ $\frac{1}{\sqrt{2}}$
2. $\tan\frac{11\pi}{6}$ $-\frac{1}{\sqrt{3}}$
3. $\csc\frac{5\pi}{4}$ $-\sqrt{2}$
4. $\cot(-450°)$ 0
5. $\cos\frac{2\pi}{3}$ $-\frac{1}{2}$
6. $\cos 53\pi$ -1

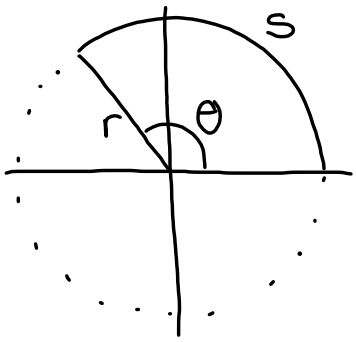




$\cot\theta = \frac{\cos\theta}{\sin\theta}$



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 $(deg, rad, revolutions, etc.)$

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

$r = 5in \;;\; \theta = 45° \;;\; s = ?\, in$ $\quad S = r\theta$

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

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

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

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

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

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

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

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

Linear Speed

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

Angular Speed

$\omega = \frac{\theta}{t}$

Arc Length

$s = r\theta$

ω = "omega"

$V = r\omega$

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 $\left(\frac{rev}{min}, \frac{deg}{s}, etc.\right)$

Relating Linear & Angular Speed

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

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?

$r = \frac{15in}{2}$; $\omega = \frac{6rad}{s}$, $V = ?$ ft/min

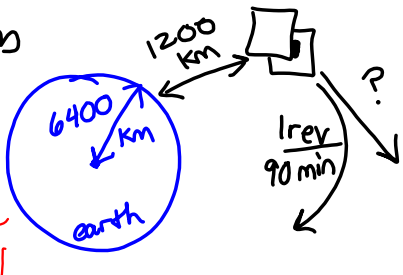
$V = r\omega = \frac{15in}{2} \cdot \frac{3}{\cancel{6}\,rad}{\cancel{s}} \cdot \frac{1\,ft}{\cancel{12\,in}} \cdot \frac{60\,\cancel{s}}{1\,min} = 225\,ft/min$

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?

$\omega = \frac{1 \text{ rev}}{90 \text{ min}}$; $r = 6400 + 1200 \text{ km}$

$= 7600 \text{ km}$

$v = ? \text{ km/min}$ $\quad v = r\omega$



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

$$= \frac{1520\pi}{9} \text{ km/min}$$