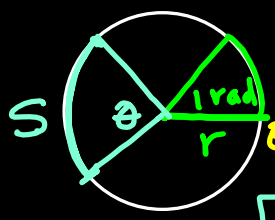
January 6, 2022

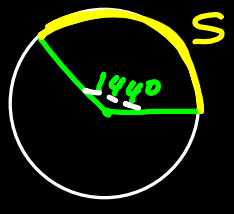
Arc Length



$\frac{S}{\theta} = \frac{r}{1\text{ rad}} \cdot \theta$

$S = r \cdot \theta$ (in rads)

Deg-Rad



$r = 120$ mm

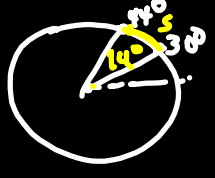
$S = r\theta$

$S = 120 \cdot \frac{144\pi}{180} = 302$ mm ≈ 300 mm (rads)

Grand Portage, MN 47° N

New Orleans, LA 30° N

Distance between cities?



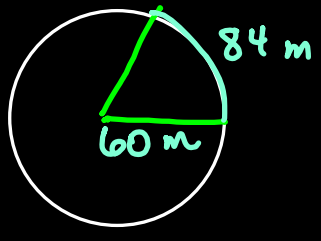
$S = r\theta$

$= 6400 \cdot \frac{17\pi}{180}$

$= 1864$ Km

$r = 6400$ Km ≈ 1600 Km

Find θ in degrees



$S = r\theta$

$\frac{84}{60} = \frac{60\theta}{60}$

$1.4 = \theta$

1.4 rads =

$1.4 \cdot \frac{180^\circ}{\pi} = 80^\circ$

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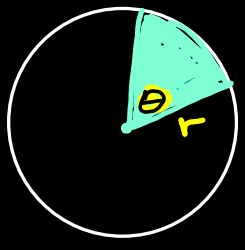
Area of Sector



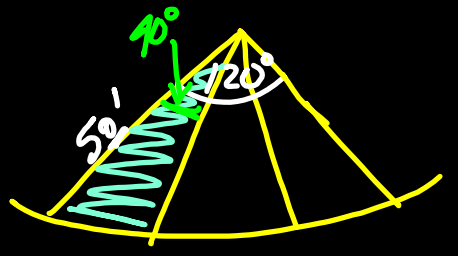
$$A = \frac{\theta}{2\pi} \cdot \pi r^2$$

$$\boxed{A = \frac{1}{2}\theta r^2}$$

m^2, ft^2

πr

πr^2



Find area.

$$A = \frac{1}{2}\theta r^2$$

$$= \frac{1}{2} \cdot \frac{40\pi}{180} \cdot 50^2$$

$$= 873 \simeq 870 \text{ ft}^2$$

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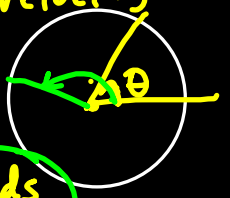
Angular & Linear Velocity

Angular Velocity

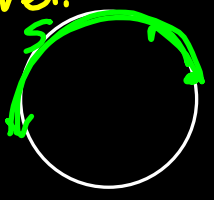
$\frac{\text{mi}}{\text{sec}} = \frac{\text{dist}}{\text{time}}$



$\frac{\text{rads}}{\text{min}}$ $\frac{\text{rads}}{\text{sec}}$

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

Linear Vel.



$\frac{\text{ft}}{\text{s}}$, $\frac{\text{mi}}{\text{h}}$

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

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

$$= r \cdot \omega$$

A merry-go-round has 6' radius & is turning at 10 $\frac{rev}{min}$. How fast is a child on the edge moving in ft/sec?

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

1 rev = 2π

$V = \frac{r \cdot \theta}{t} = \frac{6' \cdot 20\pi}{min} = 120\pi \frac{ft}{min}$

$120\pi \frac{ft}{min} \cdot \frac{1\ min}{60\ sec} = 2\pi \frac{ft}{sec} = 6.28 \frac{ft}{s}$

Top spinning at 85 $\frac{rev}{sec}$. What is its angular velocity?

$\omega = \frac{\theta}{t} = \frac{85 \cdot 2\pi}{1} = 170\pi \frac{rev}{sec}$

Diameter = 4 in. Find linear vel.

$V = r \cdot \omega = 2 \cdot 170\pi \frac{rev}{sec} = 1070 \frac{in}{s}$