

# NAVIGATION

Ship

Sail 76 mi @  $138^\circ$

Turn- Sail 90 mi @  $48^\circ$

What direction & distance must it sail in to return its home port?

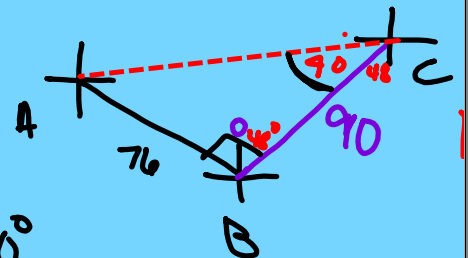
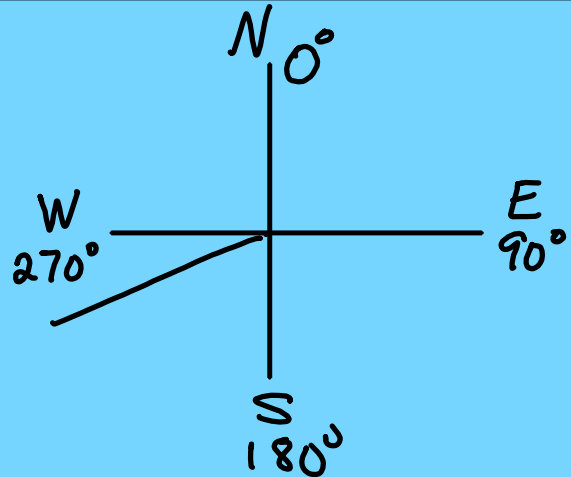
$$\begin{array}{r} 180^\circ \\ + 48^\circ \\ + 90^\circ \\ \hline 268^\circ \end{array}$$

$$\tan C = \frac{76}{90}$$

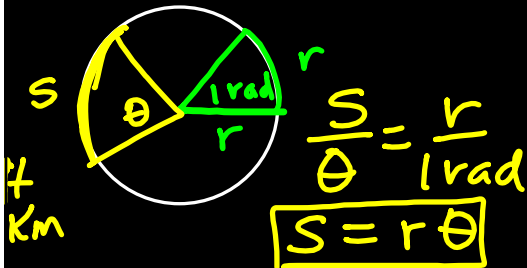
$$\tan^{-1}(76/90) = 40^\circ$$

$$C^2 = 76^2 + 90^2$$

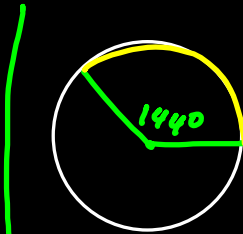
$$C \approx 118 \text{ mi.}$$



# ARC LENGTH



## Deg-Rad



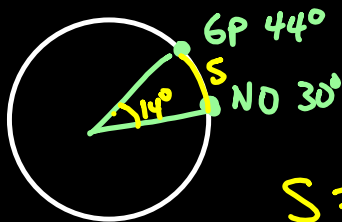
$$r = 120 \text{ mm}$$

$$S = r\theta$$

$$s = 120 \cdot 144 \frac{\pi}{180}$$

$$s = 302 \text{ mm}$$

Grand Portage, MN  $44^\circ \text{ N}$   
 New Orleans, LA  $30^\circ \text{ N}$   
 Distance between cities?



$$r = 6400 \text{ km}$$

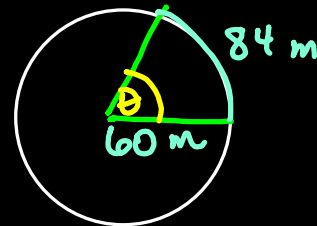
$$S = r\theta$$

$$S = 6400 \cdot \frac{14^\circ \pi}{180^\circ}$$

$$= 1564$$

$$\approx \boxed{1600 \text{ km}}$$

Find  $\theta$  in degrees.



$$S = r\theta$$

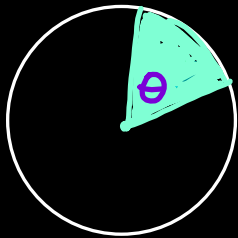
$$\frac{84}{60} = \frac{60\theta}{60}$$

$$1.4 \text{ rad} = \theta$$

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

$$80^\circ \approx \theta$$

## AREA OF SECTOR



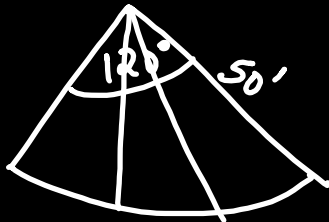
$$360^\circ = 2\pi \text{ rad}$$

$$A = \pi r^2$$

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

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

$$\frac{\text{in}^2}{\text{m}^2}$$



Find area of one pen

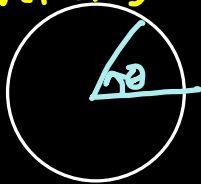
$$A = \frac{1}{2} \theta r^2$$

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

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

# ANGULAR + LINEAR VELOCITY

Angular Velocity

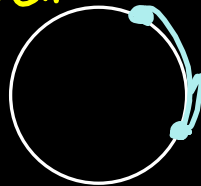


How fast center is spinning

$$\omega = \frac{\theta}{t} \quad \underline{\underline{\text{rads!}}}$$

$\frac{\text{rad}}{\text{sec}}, \frac{\text{rad}}{\text{hr}}$

Linear Vel.



How fast point on edge is moving?

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

$$\frac{\text{ft}}{\text{sec}}, \frac{\text{mi}}{\text{h}}, \frac{\text{m}}{\text{min}}$$

Leave  $\pi$  in answer.

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

$$\boxed{1 \text{ rev} = 2\pi}$$

$$v = \frac{r\theta}{t} = \cancel{\frac{r}{t}} = r \times \cancel{\theta}$$

$$v = \frac{6 \cdot (10 \cdot 2\pi)}{1 \text{ min}} = 377 \frac{\text{ft}}{\text{min}} \cdot \frac{1 \text{ min}}{60 \text{ sec}} = \frac{377}{60} = 6.3 \text{ ft/s}$$

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

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

$$= 170\pi \text{ rad/sec}$$

Beyblade