

Angular Velocity (Spin Rate)

$$\frac{\text{Angle moved through (radians)}}{\text{Time (seconds)}}$$

1 rotation = 2π

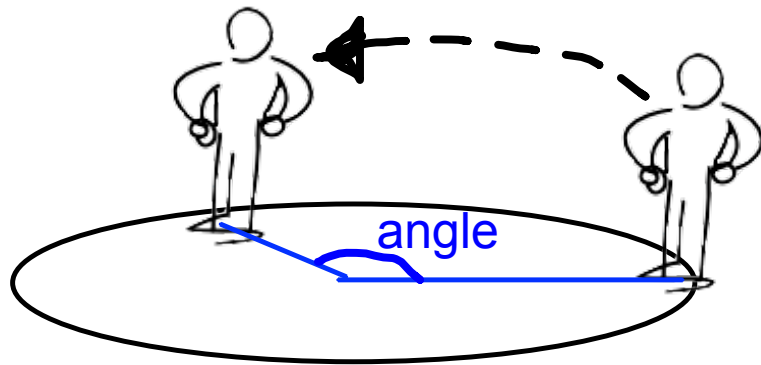
1/2 rotation = π

1/4 rotation = $\pi/2$

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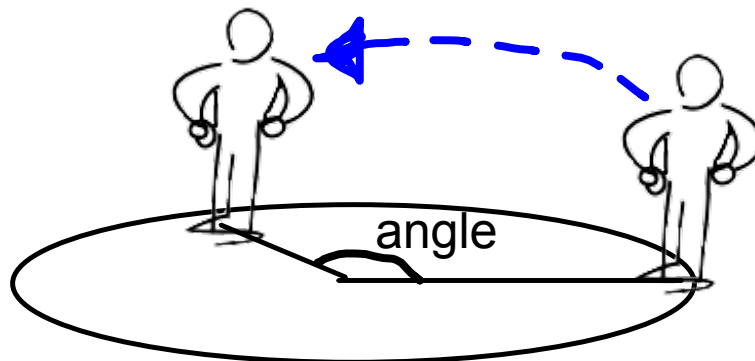
It is the same everywhere on a spinning object.

Tangential Velocity (actual m/s velocity)

Distance around
circle (meters)

Time (seconds)

or Ang. velocity x radius



Farther out = Faster V_T

Zero radius = Zero V_T

Tangential Velocity

How could those two things be the same?

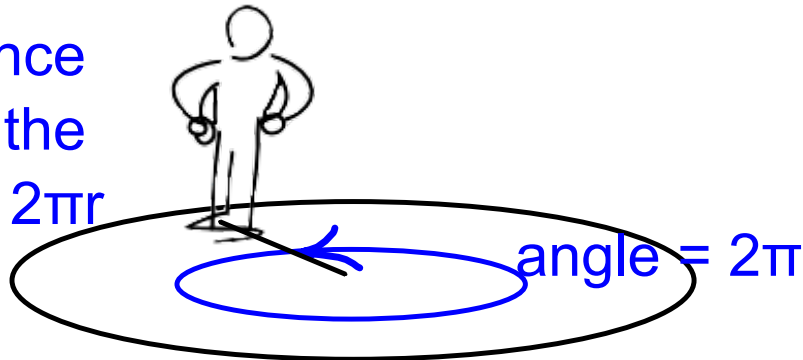
Distance around
circle (meters)

Time (seconds)

or Ang. velocity x radius

Let's say you moved all the way around the circle in a certain time.

Distance
around the
circle = $2\pi r$



Distance around the circle divided by time would be...

$$\frac{2\pi r}{\text{time}}$$

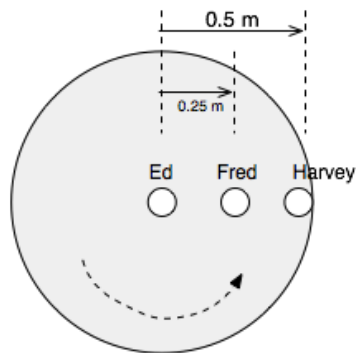
Angular velocity would be angle divided by time...

$$\frac{2\pi}{\text{time}}$$

Then multiply angular velocity by radius...

$$\left(\frac{2\pi}{\text{time}} \right) r$$

3. Calculating Angular & Tangential Velocity



Ed, Fred & Harvey are on a turntable that makes half of a rotation in 2 seconds.

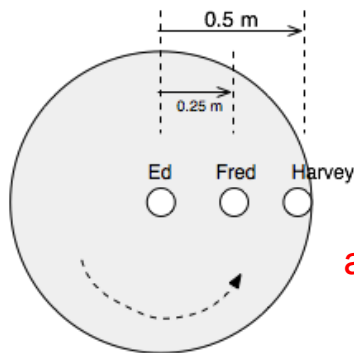
- a) What is Ed's angular velocity?
- b) What is Fred's angular velocity?
- c) What is Harvey's angular velocity?

d) What is Ed's tangential velocity?

e) What is Fred's tangential velocity?

f) What is Harvey's tangential velocity?

3. Calculating Angular & Tangential Velocity



Ed, Fred & Harvey are on a turntable that makes half of a rotation in 2 seconds.

a) What is Ed's angular velocity?

b) What is Fred's angular velocity?

c) What is Harvey's angular velocity?

} all the same!

$$\text{ang. } v = \frac{\text{angle in radians}}{\text{time}} = \frac{\pi \text{ rad}}{2 \text{ sec}} = \pi/2 \text{ rad/s}$$

For ang. v , it's ok to leave π in there.

d) What is Ed's tangential velocity?

$$V_T = (\text{ang. } v)(\text{radius}) = (\pi/2)(0) = 0$$

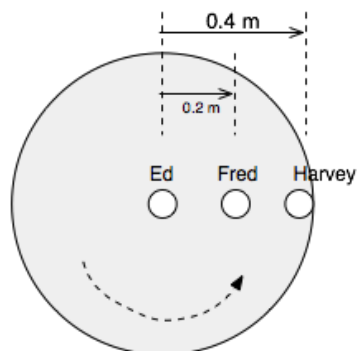
e) What is Fred's tangential velocity?

$$V_T = (\text{ang. } v)(\text{radius}) = (\pi/2)(0.25) = 0.3925 \text{ m/s}$$

For V_T , multiply π out as 3.14.

f) What is Harvey's tangential velocity?

$$V_T = (\text{ang. } v)(\text{radius}) = (\pi/2)(0.5) = 0.785 \text{ m/s}$$



Ed, Fred & Harvey are on a turntable that makes a quarter rotation in 4 seconds.

- a) What is Ed's angular velocity?
- b) What is Fred's angular velocity?
- c) What is Harvey's angular velocity?

d) What is Ed's tangential velocity?

e) What is Fred's tangential velocity?

f) What is Harvey's tangential velocity?

Try it!

Answers:

a, b & c) $\pi/8$ rad/s

d) 0 m/s

e) 0.0785 m/s

f) 0.157 m/s