At $t = 0$, Point A is located on the circle of radius 4.2 cm.

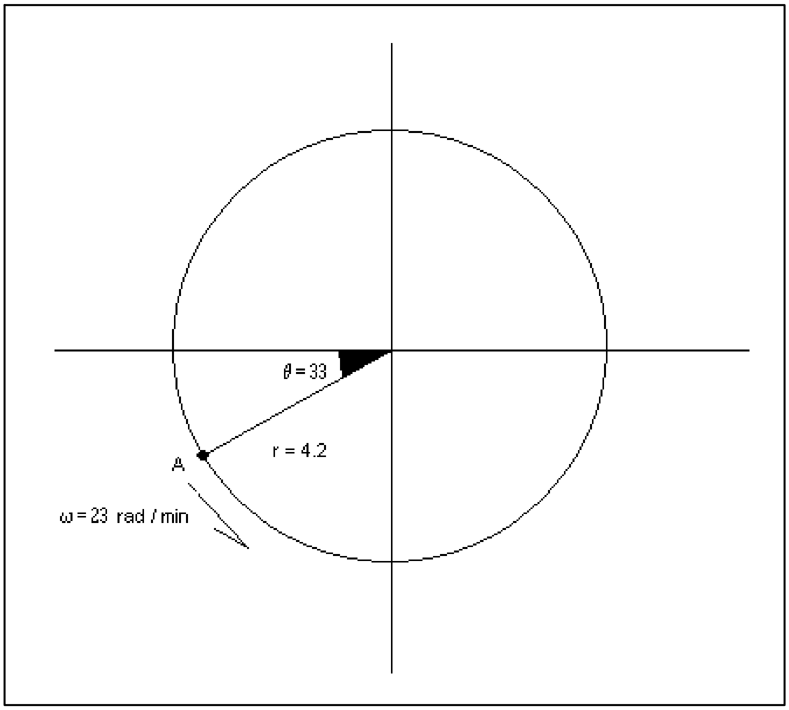
If Point A travels counter-clockwise with an angular velocity of 23 radians / minute, calulate the distance in cm along the arc Point A will travel in 4,000 seconds.

Remember to use radians and:

θ angular displacement (how many radians a point has gone around a circle)

$\omega = \frac{\theta}{t}$ angular velocity (how fast the angle is changing with respect to time)

$\alpha = \frac{\omega}{t}$ angular acceleration (how fast the angular velocity is changing with respect to time)



The equations below show how rotational and linear (at the edge of the circle) displacement, velocity, and acceleration are related .

$s = r \cdot \theta$ The linear distance (s) an object moves along the edge of a circle as a function of θ (the angle subtended) and the radius (r).

$v = \frac{s}{t} = \frac{r \cdot \theta}{t} = r \cdot \omega$ The linear velocity (v) of an object on the edge of the circle as a function of ω (the angular velocity) and the radius (r).

$a = \frac{v}{t} = \frac{r \cdot \omega}{t} = r \cdot \alpha$ The linear acceleration (a) of an object on the edge of a circle as a function of α (the angular acceleration) and the radius (r).

Problem solution:

We need to use $s = r \cdot \theta$ we know r, but not θ, so using an equation with θ ...

$\omega = \frac{\theta}{t}$ or $\theta = \omega \cdot t$ since we know ω and t $\omega := 23 \cdot \frac{rad}{min}$ $t := 4000 \cdot sec$

$r := 4.2 \cdot cm$ $\theta := \omega \cdot t$ $\theta = 1.533 \times 10^3$ **note: θ is REALLY Dimensionless!**

Since we know θ now, we can calculate s thus: $s := r \cdot \theta$ $s = 64.4\,m$