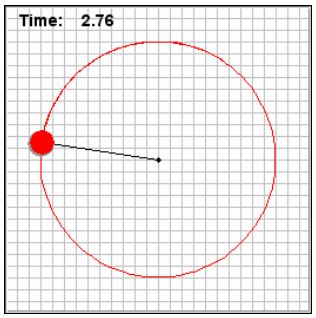
Worksheet for Exploration 10.2: Constant Angular Acceleration Equation



By now you have seen the equation: $\theta = \theta_0 + \omega_0 * t + 0.5 * \alpha * t^2$. Perhaps you have even derived it for yourself. But what does it really mean for the motion of objects? This Exploration allows you to explore all three terms in the equation: the initial angular position by changing θ_0 from 0 radians to 6.28 radians, the angular velocity term by changing ω_0 from -15 rad/s to 15 rad/s, and the angular acceleration by changing α from -5 rad/s^2 to 5 rad/s^2. Restart.

Answer the following questions **(position is given in meters and time is given in seconds)**.

a. How does changing the initial angular position (θ_0) affect the motion of the object?

b. How does changing the initial angular velocity (ω_0) affect the motion of the object?

c. How does changing the angular acceleration (α) affect the motion of the object?

d. Can you get the object to change direction?
   i. Try different combinations of initial angular velocity and angular acceleration (which is constant).

Additional Questions

For your selected values of angular position, velocity, acceleration and a couple of times, complete the following table.

θ_o=_____ ω_o=_____ α=_____	θ_t	$\Delta\theta_t$	ω	Δs	v_{tang}	a_{tang}
t1=_____						
t2=_____						

Now select a set of positive values for initial angular position, initial angular velocity, and a negative angular acceleration. Before running the simulation, see if you can predict the following.

i. How long does it take until the angular velocity becomes zero?

ii. Through how much angle has it traveled?

iii. What is the average angular speed for this trip?