

MODELING HARMONIC MOTION

When motion is neither driven or damped, it is referred to as simple harmonic motion. This motion is periodic and oscillates about an equilibrium position in a sinusoidal pattern. Each oscillation is identical and therefore the period, frequency, and amplitude are the same. In most oscillating occasions, friction causes the motion to slow down. This is known as damping. On a ride, if the initial displacement is zero, the displacement, x , at any given time, t , of the



damped harmonic motion is defined as the following:
 $x(t) = Ae^{-\alpha t} \cos(2\pi t + \phi)$. Using The Rocket Blast-Off!, investigate and identify each component of the equation.

Questions

1. Measure how long does it take the ride to reach the top of the ride in seconds?
2. Draw the wave graph with respect to the riders' position versus time?
3. Looking at the graph, which parts represent A , α , and ϕ from the equation?
4. Now investigate what causes the different constants identified on the graph to occur?
5. Why does the graph gradually come to a stop rather than continually repeating the same motion? What is this known as?