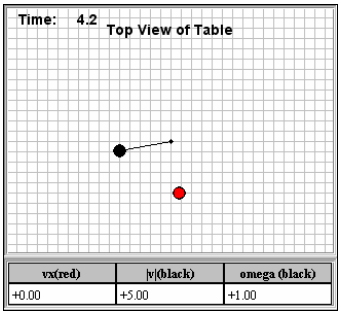
Worksheet for Exploration 11.4: Moment of Inertia and Angular Momentum



A 1-kg red mass is incident on an identical black mass that is attached to a massless rigid string so that it can rotate around the origin as shown **(position is shown in meters and time is shown in seconds)**. At t = 2.6 s the red mass undergoes a completely elastic collision with the black mass. Restart.

Watch the animation. You may vary the radius of the pendulum between 2 and 10 m. Answer the first three questions before clicking the "see other variables" check box.

a. As you reduce the length of the pendulum, does the angular speed of the pendulum increase or decrease? (PREDICT)
   i. Measure for several different r's and rank in order of increasing angular speed.

r	Angular Speed
	5 (highest)
	4
	3
	2
	1 (lowest)

b. From what you know about conservation laws, state whether you think linear momentum, angular momentum and kinetic energy are conserved during the animation. Why?
   i. Linear Momentum

   ii. Angular momentum

   iii. Kinetic Energy

c. Set R = 1.5 m. Calculate the linear momentum, angular momentum (about the origin), and kinetic energy of the system at t = 1, 2, 4, and 5 s.

i. Linear Momentum

ii. Angular Momentum

iii. Kinetic Energy

You may now click the check box.

d. If your answers differ from what you thought, explain why they differ.