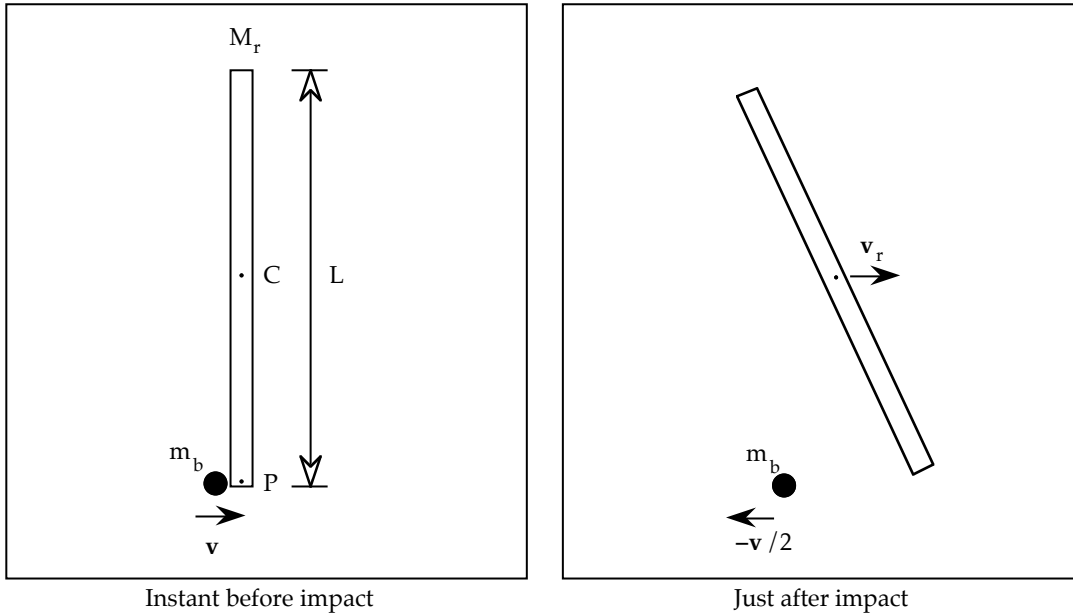


An old angular collision problem from the files.

As viewed from above



1. A thin uniform rod of mass M_r and length L is initially at rest on a frictionless horizontal surface. The moment of inertia of the rod about its center of mass (Pt. C) is $(1/12)M_rL^2$. As shown above, the rod is struck (at Pt. P) by a ball with mass, m_b , whose initial velocity v is perpendicular to the rod. After the collision, the ball has a velocity $-v/2$. Answer the following questions in terms of the symbols given.
 - a. Using linear momentum, determine the velocity v_r of the center of mass of the rod after the collision.
 - b. Using angular momentum, determine the angular velocity ω of the rod about its center of mass after the collision.
 - c. Write (and simplify) a relationship for the kinetic energy of the system after the collision. (Note: this may be somewhat “ugly” but can be simplified to a reasonable degree.)