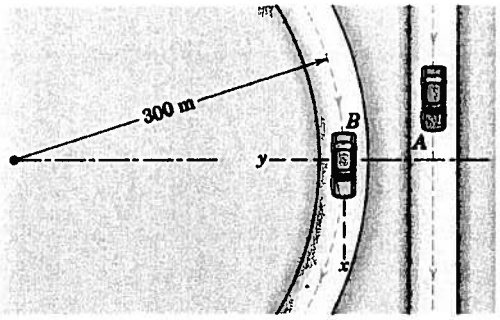
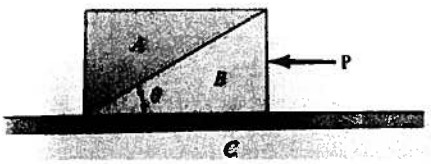
ME 104; Spring 2014
Professor MA

MT I

1. For the instant represented, car A has a speed of 100 km/h, which is increasing at the rate of 8 km/h each second. Simultaneously, car B also has a speed of 100 km/h as it rounds the turn and is slowing down at the rate of 8 km/h each second. (a) Determine the magnitude of the acceleration that car B appears to have to an observer in car A. (b) Is the acceleration of car A as observed from car B equal and opposite the acceleration found earlier? Explain.



2. Blocks A and B each have the same mass $m = 2\,\text{kg}$ and $\theta = 45°$. The coefficient of static friction for all contacting surfaces is $\mu_s = 0.5$ and the coefficient of kinetic friction for all contacting surfaces is $\mu_k = 0.2$. The horizontal force P is applied to block B so that blocks A and B are translating on the surface C. Calculate P when block A is about to slide upwards relative to block B.



3. A particle is traveling as indicated on a smooth horizontal plane until, at distance L from the right wall, an impulsive explosion separates the initial particle into two sub-particles A and B. After time Δt_A has elapsed from the explosion particle A collides with the wall at y_A.
Given: $v_i = 4\,\text{m/s}$, $m_A = 4\,\text{kg}$, $m_B = 1\,\text{kg}$, $m = m_A + m_B$, $L = 10\,\text{m}$, $y_A = 7.5\,\text{m}$, $\Delta t_A = 3\,\text{s}$.
Determine: (1) The impulse I_A on particle A; (2) the time Δt_B elapsed before particle B impacts the wall; (3) y_B.