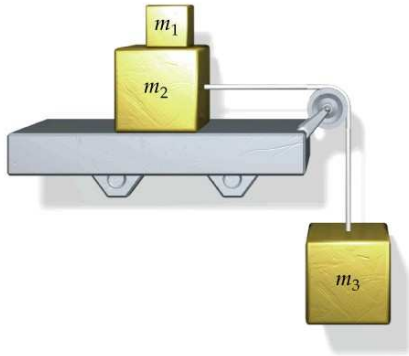


P195A Practice-makes-perfect problems

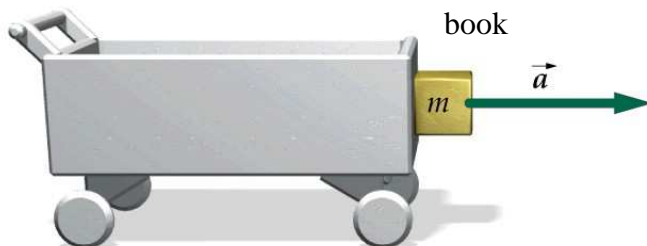
1. In the figure below, the mass m_2 slides on a frictionless table. The coefficients of static and kinetic friction between m_2 and m_1 are $\mu_s = 0.600$ and $\mu_k = 0.400$. What is the maximum value of m_3 if m_1 moves with m_2 without slipping? Let $m_1 = 5.00$ kg and $m_2 = 10.00$ kg.



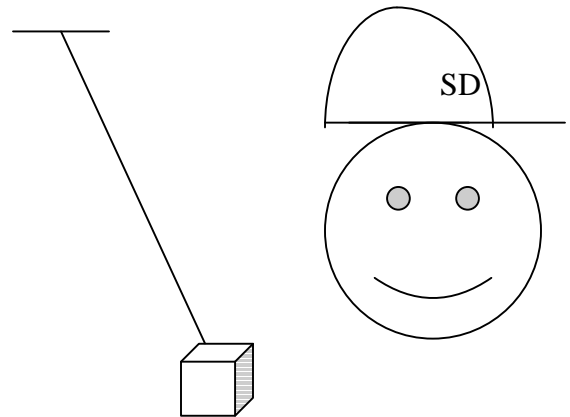
2. Brenda is driving in her new Land Cruiser on her way to physics class. She is approaching a dip in the road. What must the speed of her vehicle be at the bottom of the dip so that she feels three times her body weight? The radius of curvature of the dip is 28.4 meters.



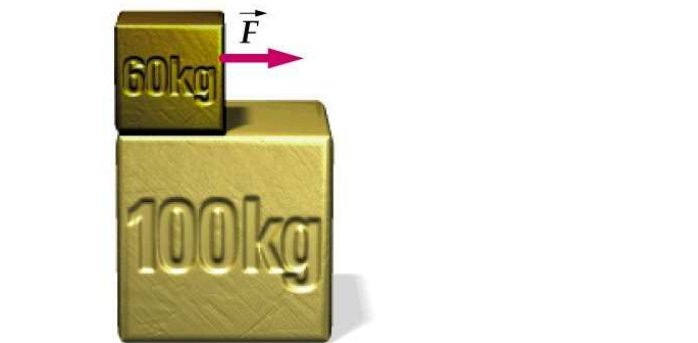
3. Sergio bets a naïve physics student (Beavis) that he can place his 2.00-kg physics book against the side of a cart, as shown below, and that the book will not fall to the ground, even though Sergio will use no hooks, ropes, fasteners, magnets, glue, or adhesives of any kind. When the student accepts the bet, Sergio begins to push the cart in the direction shown. The coefficient of static friction between the block and the cart is 0.600, and the coefficient of kinetic friction is 0.250. Find the minimum acceleration for which Sergio will win the bet and take all of Beavis' nacho money.



4. While on your way to school, you accidentally run a red light that is equipped for photo-enforcement. The police department sends you a nice 8" X 10" color glossy picture of you in your car as it speeds through the intersection. Enclosed with the red-light fine is also a speeding ticket!! The speed limit is 30 miles per hour (13.4 m/s), and they claim that you were traveling at 35 miles per hour (15.6 m/s). It looks like you now have to pay **both** fines. But wait!!! You notice in the picture that the fuzzy dice that hang from your rearview mirror make an angle of 30° from the vertical. You now drive out to the 'scene of the crime' and measure the radius of curvature of the turn to be 22 meters. Calculate the speed that car had as it was rounding the curve in the photograph. You may be able to show the judge that you were not exceeding the speed limit!



5. A 60.0-kg block slides along the top of a 100.0-kg block with an acceleration of 3.00 m/s^2 when a horizontal force F of 320.0 N is applied, as shown below. The 100.0-kg block sits on a horizontal frictionless surface, but there is friction between the two blocks. Find the acceleration of the 100.0-kg block during the time that the 60-kg block remains in contact.



Answers: 1. $m_3 = 22.500\text{kg}$ 2. $v = 23.605 \text{ m/s}$ 3. $a = 16.4 \text{ m/s}^2$ 4. 24.97 mph 5. $a = 1.4 \text{ m/s}^2$