Answer on Question #67138- Physics-Mechanics-Relativity

5. In the diagram, if m1 is 8.0 kg and m2 is 10.0 kg and the ramp is at a 35.0o angle find the acceleration of the masses assuming there is no friction. What would be the fk for the system to be at equilibrium?

Solution

$$m_1 a = T - m_1 g(\sin 35)$$

$$m_2 a = m_2 g - T$$

$$a = g\frac{m_2 - m_1(\sin 35)}{m_1 + m_2} = 9.8\frac{10 - 8(\sin 35)}{10 + 8} = 2.9\frac{m}{s^2}$$

For equilibrium:

$$a = g\frac{m_2 - m_1(\sin 35 + \mu\cos 35)}{m_1 + m_2} = 0$$

$$m_2 - m_1(\sin 35 + \mu\cos 35) = 0$$

$$10 - 8(\sin 35 + \mu\cos 35) = 0$$

$$\mu = 0.83.$$

6. A child shoots a 3.0 g bottle cap up a ramp 20o above horizontal at 2.0 m/s. The cap slides in a straight line, slowing to 1.0 m/s after traveling some distance, d. If fk is 0.40, find that distance.

Solution

$$v_f^2 - v_i^2 = -2ad$$

$$a = g(\sin\alpha + \mu\cos\alpha)$$

$$d = -\frac{v_f^2 - v_i^2}{2g(\sin\alpha + \mu\cos\alpha)} = \frac{2^2 - 1^2}{2(9.8)(\sin 20 + 0.4\cos 20)} = 0.21\ m.$$

7. Two monkeys with equal mass hang from the ends of a rope passing over a weightless, frictionless pulley. If one accelerates up the rope at 1.0 m/s2, what will happen to the other?

Solution

$$ma + mg = T$$

$$ma_1 = T - mg = ma + mg - mg = ma.$$

Thus, the second monkey would accelerate up at 1.0 m/s2.