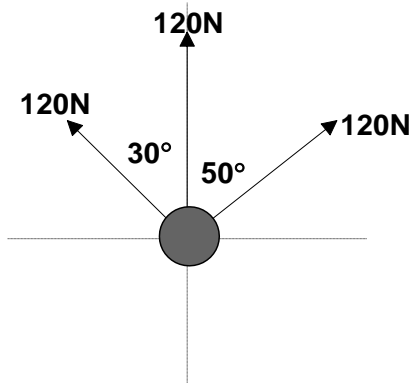## Review Problems : Newton's Laws in 2 Dimensions

1. A tire with mass 20kg is being pulled by three ropes as shown. If the tire is being dragged along a concrete floor and the coefficient of kinetic friction with the floor is μ_k is 0.80, what is the acceleration of the tire?

120N

120N **120N**

30° 50°

2. A 4.0 kg mass is sliding along a level surface at 15 m/s and then begins sliding up a ramp that is elevated 28° above the horizontal. (assume the ramp has a slight curve at the bottom that allows the mass to make a smooth transition from the horizontal to the surface of the ramp).

The coefficient of friction between the mass and the ramp is 0.25. How far up the ramp will the mass slide?

28°
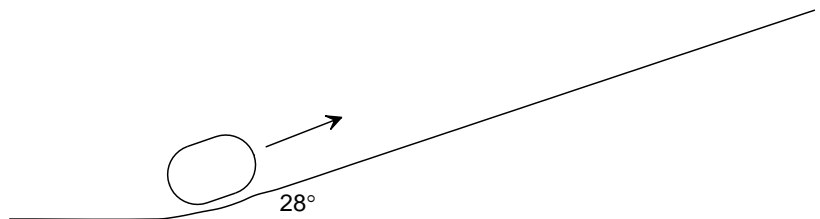
3. Solve the distance travelled for a mass sliding up a ramp (as in problem #2) given the following initial conditions:
   a. V_1=12 m/s, μ_k = 0.15, mass=10.0kg, θ=15°
   b. V_1=8.0 m/s, μ_k = 0.62, mass=22.0kg, θ=23°

4. Find the critical angle (i.e. the angle when an object would first start sliding) for the following scenarios.
   a. μ_s = 0.25, mass=10.0kg,
   b. μ_s = 0.72, mass=22.0kg,

Answers :

1. a = 7.3 m/s² [83.9°AH]
2. d = 16.6m
3a. d= 18.1m   3b. d=3.4m
4a. θ=14°   4b. θ=36°