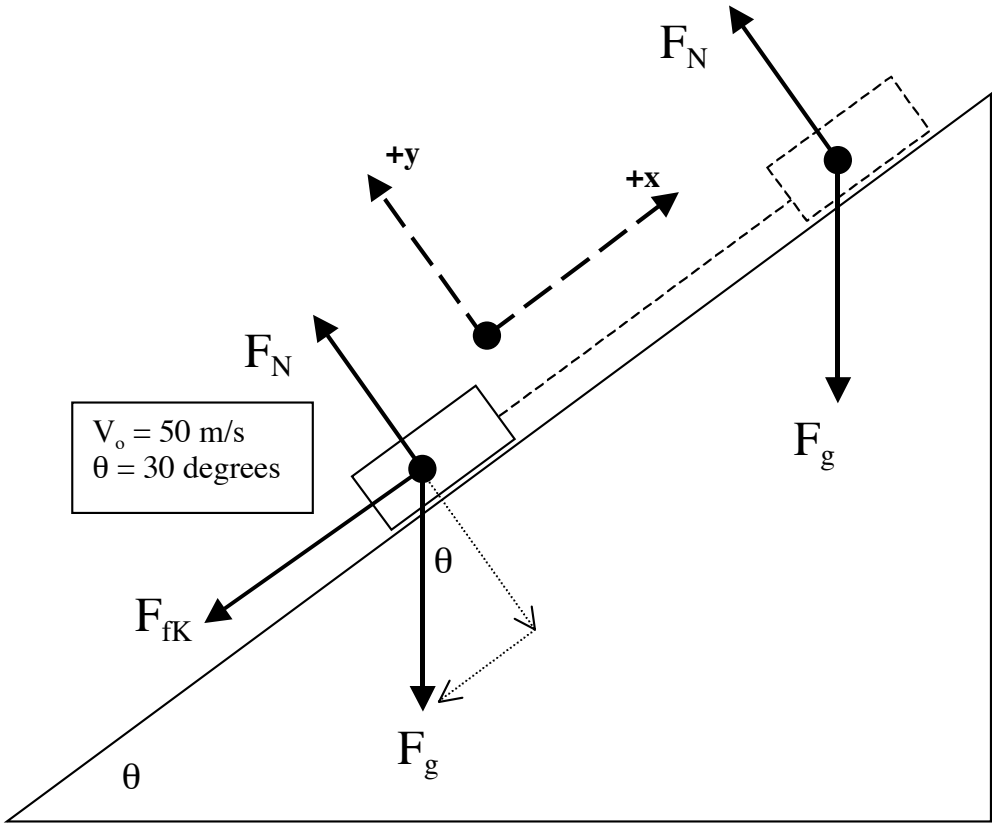
Your Initials YI

Problem Set and Problem Number PS6 - 3

You do not need to re-write the problem statement. It is included here for clarity.

An object comes to rest as it slides uphill. The object has an initial speed of 50 m/s along the surface of the hill, which is inclined at 30 degrees with respect to the horizontal. If the hillside has a kinetic coefficient of friction of 0.4, how far does the object move?



Start with a sketch and don't skimp on space. Indicate coordinate system directions!

When in doubt, start with the definitions. What are you looking for? What do you know? It is very helpful to write brief comments as you work,

Looking for Δx., knowing initial and final velocities and forces. Solve forces to get acceleration. Use acceleration and velocity to find displacement.

$$\sum \vec{F}_X = F_{fK}(-\hat{x}) + F_g \sin\theta(-\hat{x}) = ma_x$$

$$F_{fK} = \mu F_N = \mu mg\cos\theta; F_g = mg$$

$$\therefore \mu mg\cos\theta(-\hat{x}) + mg\sin\theta(-\hat{x}) = ma_x$$

$$g[\mu\cos\theta + \sin\theta](-\hat{x}) = a_x$$

Then look to 1-D EoM to find relationship needed with given information. Work with symbols, then substitute units.

$$v_f^2 = v_o^2 + 2\vec{a}\bullet\Delta\vec{x} = v_o^2 - 2\vec{a}\Delta\vec{x}$$

$$\frac{v_f^2 - v_o^2}{-2\vec{a}} = \Delta\vec{x}$$

$$\frac{0 - (50\,\frac{m}{s})^2}{-2(9.81\,\frac{m}{s^2})[0.4\cos 30 + \sin 30]} = \Delta x$$

$$\frac{25\bullet 10^2\,\frac{m^2}{s^2}}{16.6\,\frac{m}{s^2}} = 1.51\bullet 10^2\,m$$

$$\Delta x = 151m$$

$$\boxed{\Delta x = 151m}$$