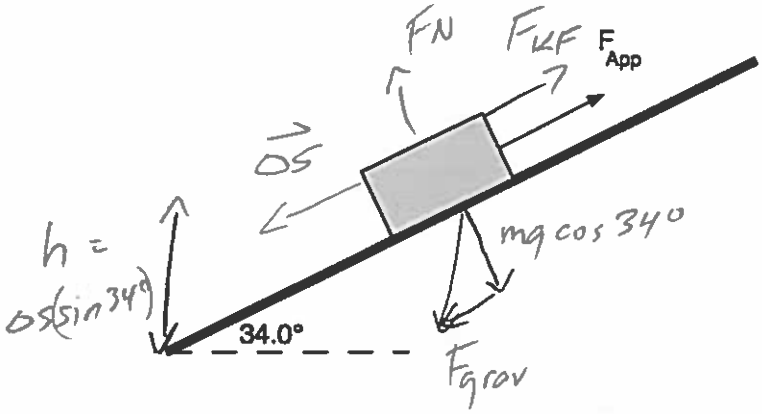
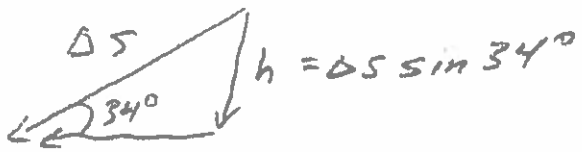
Physics 10154 - Quiz 6B

A 12.4-kg block, starting from rest, slides DOWN the incline shown below, despite the applied force of 25.0 Newtons directed parallel to and up the incline. After moving through a displacement of 2.17 meters, the block is moving with a speed of 3.44 m/s.

a) Determine the work done by the force of kinetic friction in this problem.
b) Determine the coefficient of kinetic friction between the block and the surface.





$\Sigma F_\perp = F_N - mg\cos 34^\circ = 0$

$F_N = mg\cos 34^\circ$

$W_N = 0$

$W_{App} = F_{App}\,\Delta s \cos 180^\circ = -(25)(2.17) = -54.25\ J$

$W_g = +mgh = +(12.4)(9.8)(2.17)(\sin 34^\circ) = 147.46\ J$

$W_{KF} = ?$

$\Delta K = \frac{1}{2}mv^2 - \frac{1}{2}mv_0^2 = \frac{1}{2}(12.4)(3.44)^2 = 73.37\ J$ ($v_0 = 0$)

$\Sigma W_F = 0 - 54.25 + 147.46 + W_{KF} = 73.37$

$\boxed{W_{KF} = -19.8\ J}$

$W_{KF} = \mu_K F_N\,\Delta s \cos 180^\circ$

$= -\mu_K (mg\cos 34^\circ)\Delta s = -19.8$

$\mu_K = \dfrac{-19.8}{-218.62} = \boxed{.0906}$