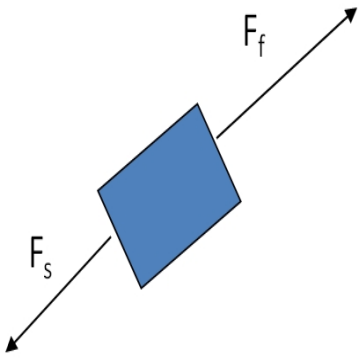
Friction on an Incline

- A 45 kg box is sitting on a 30 degree incline. What is the coefficient of static friction between the box and the incline? If the coefficient of kinetic friction is 80% of the coefficient of static friction, how much mass must be removed from the box in order to begin sliding down the ramp at a constant speed? With what acceleration would the box slide down the ramp?



$\Sigma F_{incline} = 0$

$F_{go} - F_{slow} = 0$

$F_s - F_f = 0$

$F_s = F_f$

$mg\sin\theta = \mu\, mg\cos\theta$

$\sin\theta = \mu\cos\theta$

$\mu = \sin\theta/\cos\theta$

$\mu_s = \tan 30 = 0.58$

$\mu_k = 0.8\,(0.58) = 0.46$

$\Sigma F_{incline} = ma$

$F_{go} - F_{slow} = ma$

$F_s - F_f = ma$

$mg\sin\theta - \mu\, mg\cos\theta = ma$

$g\sin 30 - \mu\, g\cos 30 = a$

$9.8\,(.5) - .46(9.8)(.866) = a$

$4.9 - 3.92 = a$

$0.98\ m/s^2 = a$