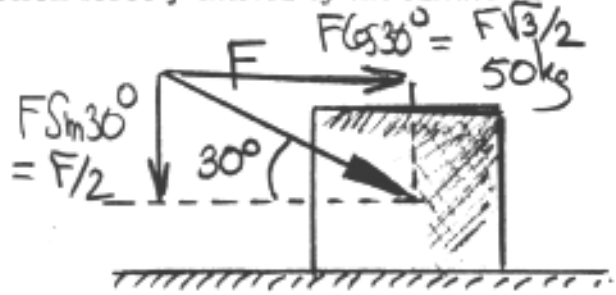
Problem

A 50.0 kg-block rests on a rough horizontal surface with coefficients of static and kinetic friction $\mu_s = 0.400$ and $\mu_k = 0.200$. A force of magnitude F directed at 30° below the horizontal (see figure below) pushes the block.

If F=100 N, find the **normal force** F_N and the **friction force** f exerted by the surface on the block. Find also the block's **acceleration**.



$F_N = mg + F/2 = 490.5 + 50$

$= 540.5\ N$

$F_S^{MAX} = F_N/\mu_S = 216.2 > FCos30° = 86.6\ N \longrightarrow$ NO MOTION

$f = f_S = 86.6\ N$, $a = 0\ m/s^2$

If F=200 N, find the **normal force** F_N and the **friction force** f exerted by the surface on the block. Find also the block's **acceleration**.

$F_N = mg + F/2 = 490.5 + 100 = 590.5\ N$

$F_S^{MAX} = F_N/\mu_S = 236.2 > FCos30° = 173.2 \longrightarrow$ NO MOTION

$f = f_S = 173.2\ N$, $a = 0\ m/s^2$

If F=500 N, find the **normal force** F_N and the **friction force** f exerted by the surface on the block. Find also the block's **acceleration**.

$F_N = mg + F/2 = 490.5 + 250 = 740.5\ N$

$F_S^{MAX} = F_N/\mu_S = 296.2\ N < FCos30° = 433\ N \longrightarrow$ it MOVES

$f = f_K = F_N/\mu_K = 148.1\ N$ $\quad a = \frac{433 - 148.1}{}$