Name: _____ **Section:** _____

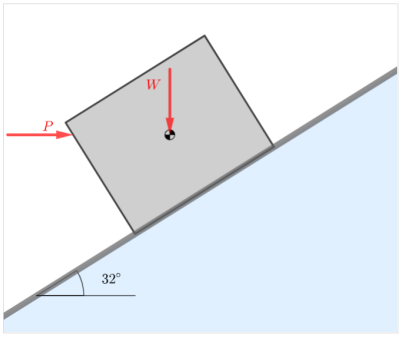
AEM 2011 Quiz #12
Tuesday, April 18, 2023

A non-communicating calculator is allowed. Full credit will only be given if all steps used are clearly communicated (free body diagrams, algebra, etc).

A horizontal force P is applied to a W lbs box resting on an 32° incline. The line of action of P passes through the center of gravity of the box. The coefficients of friction between the box and the surface are $\mu_s = 0.1$ and $\mu_k = 0.080$. The magnitude of force P is such that the box is about the begin sliding up the incline.
At this condition, draw the free-body diagram (FBD) for the box in two ways:

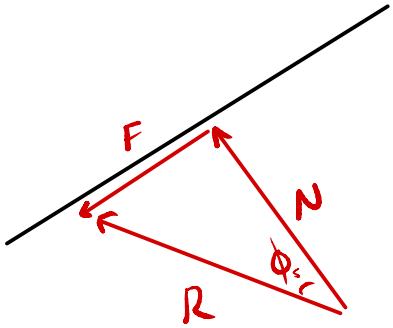
1. Showing the normal (N) and friction (F) forces as separate vectors.
2. Combine the normal and friction forces into a single resultant vector (R) acting at a known angle.

There is no need to compute the magnitude of the forces. However, make sure all force vectors in either FBD have clear directions with numeric angles.



Useful Relationships:

- Static Friction: $F_m = N\mu_s$
- Kintetic friction: $F_k = N\mu_k$
- Angle of static friction: $\tan\phi_s = \mu_s$
- Angle of kinetic friction: $\tan\phi_k = \mu_k$



$\phi_s = \arctan(\mu_s)$

$= 5.71°$

this makes sense because μ_s is very small, thus F is very small