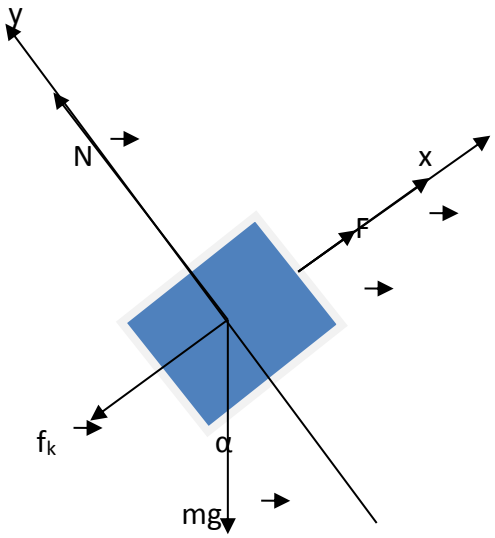
Task #81292

A crate of mass 30.0 kg is pulled by a force of 180 N up an inclined plane which makes an angle of 30º with the horizon. The coefficient of kinetic friction between the plane and the crate is μk = 0.225. If the crates starts from rest, calculate its speed after it has been pulled 15.0 m. Draw the free body diagram. **Solution.**

Free body diagram for body.



Newton Second Low is:

$\vec{mg} + \vec{N} + \vec{F} + \vec{f_k} = \vec{ma}$

$f_k = \mu_k * N = \mu_k * mg * \cos\alpha$ (N = mg)

$ma = F - mg * \sin\alpha - \mu_k * mg * \cos\alpha$

$a = (F - mg * \sin\alpha - \mu_k * mg * \cos\alpha)/m$

$a = (180 - 30*9.8*0.5 - 0.225*30*9.8*0{,}87)/30 = (180-147-57.5505)/30 = -0.81\ m/s^2$

This mean that crate will stay at rest. Force = 180 N and it compensates weigh projection on x-axis $mg*\sin\alpha \approx 150$ N, but there is not so much to overcome the friction force, which is $\mu_k * mg * \cos\alpha \approx 58.45$ N

Answer:

Crate will stay at rest.