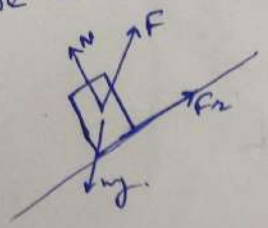
A block is moving on an inclined plane making an angle 45° with the horizontal and the coefficient of friction is μ. The force required to just push it up the inclined plane is 3 times the force required to just prevent it from sliding down. If we define $N = 10\mu$, then N is **[IIT-JEE-2011]**

Sol^n] Case 1

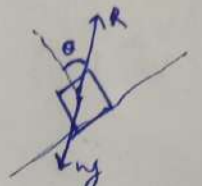


$\boxed{N + F_x = R}$

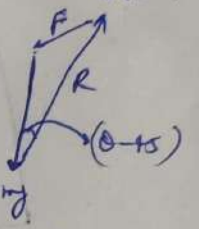
as in limiting case $F_x = \mu N$

and R will make $(\tan^{-1}(\mu))$ angle from N.

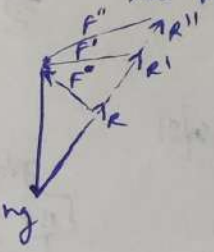
So,



So F will balance R and mg:



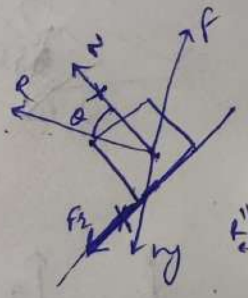
magnitude of R can vary so Fmin when $F \perp R$.



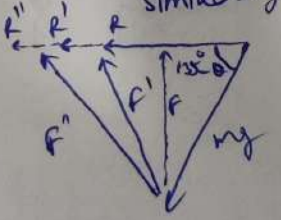
So, $\vec{F} = mg \sin(\theta - 45)$

$F_{min} \Rightarrow mg \cos(135 - \theta)$

Case - 2



Similarly



$F_{min} = F$ so,

$F = mg \sin(135 - \theta)$

So, $3\cos(135 - \theta) = \sin(135 - \theta)$

$\tan(135 - \theta) = 3$

$135 - \theta = \tan^{-1}(3)$

$\boxed{\theta = 135^\circ - \tan^{-1}(3)}$

$\mu = \tan\theta \Rightarrow \tan(135 - \theta \tan^{-1}(3))$

$\frac{-1-3}{1+(-3)} \Rightarrow +2$

$\boxed{10\mu = 20}$