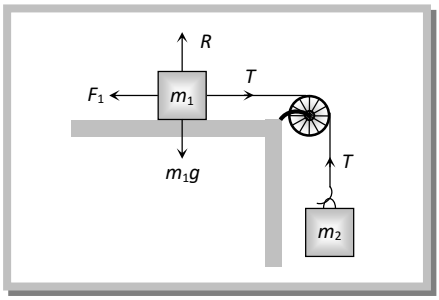
Minimum Mass Hung From the String to Just Start the Motion.

(1) **When a mass m_1 placed on a rough horizontal plane:**Anothermass m_2 hung from the string connected by pulley, the tension (T) produced in string will try to start the motion of mass m_1.



At limiting condition

$T = F_l$

$\Rightarrow m_2 g = \mu R$

$\Rightarrow m_2 g = \mu m_1 g$

$\therefore m_2 = \mu m_1$ This is the minimum value of m_2 to start the motion.

Note: In the above condition Coefficient of friction $\mu = \dfrac{m_2}{m_1}$

(2) **When a mass m_1 placed on a rough inclined plane:** Anothermass m_2 hung from the string connected by pulley, the tension (T) produced in string will try to start the motion of mass m_1.

At limiting condition

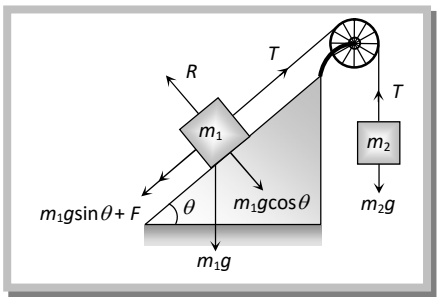
For m_2 $\quad T = m_2 g$ ..... (i)

For m_1 $\quad T = m_1 g \sin\theta + F \Rightarrow T = m_1 g \sin\theta + \mu R$

$\Rightarrow T = m_1 g \sin\theta + \mu m_1 g \cos\theta$ .....(ii)

From equation (i) and (ii) $m_2 = m_1[\sin\theta + \mu\cos\theta]$

this is the minimum value of m_2 to start the motion



Note: In the above conditionCoefficient of friction

$$\mu = \left[\frac{m_2}{m_1 \cos\theta} - \tan\theta\right]$$