Inclined Planes

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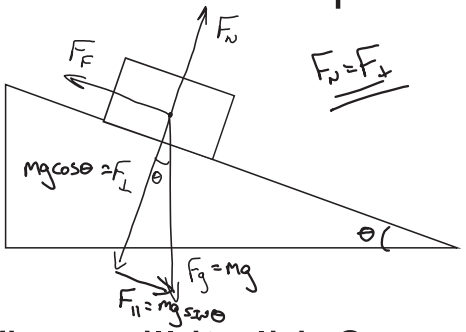
- What forces are present on the box?



- When will it slide?

When $F_{||} \geq F_F$

$F_{||} \geq F_F$

$F_g \sin\theta \geq \mu F_N$

$mg\sin\theta \geq \mu F_\perp$

$mg\sin\theta \geq \mu\, mg\cos\theta$

$\sin\theta \geq \mu\cos\theta$

$\frac{\sin\theta}{\cos\theta} \geq \mu$

$\tan\theta \geq \mu$

$\theta \geq \tan^{-1}\mu$

When will it slide?

- A packing crate is placed on a 20^0 inclined plane. If the coefficient of friction between the crate and the plane is 0.65, will the crate slide down the plane?

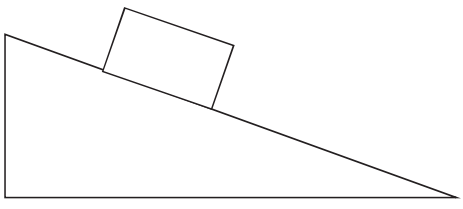
$\theta \geq \tan^{-1}(.65)$

$\theta \geq 33^\circ$

20°

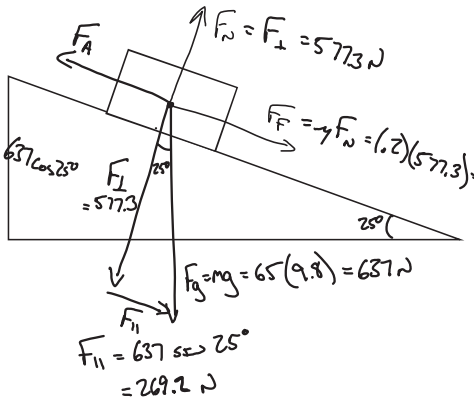
Inclined Plane Example

- A 65.0 kg crate is accelerated at 7 m/s^2 up an incline making a 25.0^0 angle with the horizontal. If the coefficient of sliding friction between the crate and the incline is 0.200, how much force is required ?



Inclined Plane Example

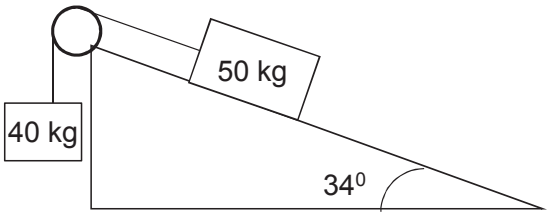
$F_{NET} = MA$
$= (65kg)7$
$= 455\ N$



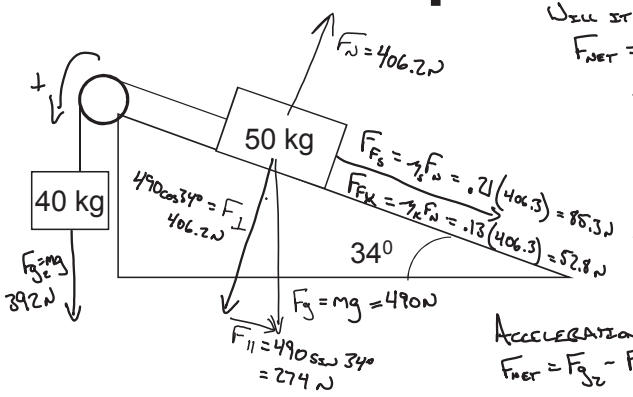
$F_{NET} = F_A - F_{||} - F_F$
$455N = F_A - 269.2\ N - 115.46$
$455N = F_A - 384.67$
$F_A = 839.7\ N$

Incline Plane Example 2

- If μ_s between the incline and box is 0.21 and the μ_k is 0.13, will it accelerate? If it does, what is the acceleration and in what direction?



Incline Plane Example 2



Will it move?

$F_{NET} = F_{g_2} - F_{11} - F_{F_S}$

$= 392 - 274 - 85.3$

$= 32.7 \Rightarrow$ it will move

Acceleration

$F_{NET} = F_{g_2} - F_{11} - F_{F_K}$

$F_{NET} = 392 - 274 - 52.8N$

$= 65.2N$

$\frac{65.2}{90} = \frac{90A}{90}$

$A = .72 m/s^2$