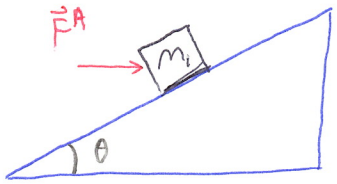
FORCES: INCLINED PLANES - FUNDAMENTAL EXAMPLE SOLUTIONS

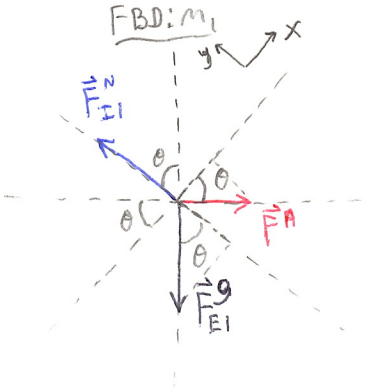
(1)



GIVEN: $|\vec{F}^A| = 8\,N$

$m_1 = 1.5\,kg$

$\theta = 60°$



$\Sigma F_x = m_1 a_{1x}$

$F^A_x - F^g_{E1x} = m_1 a_{1x}$

$|\vec{F}^A|\cos(\theta) - |\vec{F}^g_{E1}|\sin(\theta) = m_1 a_{1x}$

$|\vec{F}^A|\cos(\theta) - m_1 g \sin(\theta) = m_1 a_{1x}$

$$a_{1x} = \frac{|\vec{F}^A|\cos(\theta) - m_1 g \sin(\theta)}{m_1}$$

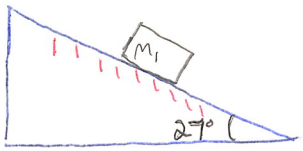
$$a_{1x} = \frac{8\cos(60) - (1.5)(9.8)\sin(60)}{1.5}$$

$$a_{1x} = \frac{4 - 12.73..}{1.5}$$

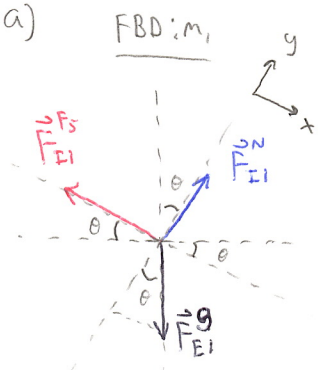
$$a_{1x} \approx -5.8\ m/s^2$$

↖ NEGATIVE, SO ACCELERATION IS DOWN THE INCLINE.

(2)



a)



$\Sigma F_x = m_1 a_{1x}^{\,0}$

$-F^{Fs}_{I1x} + F^g_{E1x} = 0$

$-|\vec{F}^{Fs}_{I1}| + |\vec{F}^g_{E1}|\sin(\theta) = 0$

$|\vec{F}^{Fs}_{I1}| = m_1 g \sin(\theta)$

$|\vec{F}^{Fs}_{I1}| = (1381)(9.8)\sin(27)$

$|\vec{F}^{Fs}_{I1}| = 6144\,N$

$\vec{F}^{Fs}_{I1} = \langle -6144, 0 \rangle N$

b) SAME FBD AS a) BUT $|\vec{F}^{Fs}|$ IS NOW $|\vec{F}^{Fs,max}|$

$\Sigma F_y = m_1 a_{1y}^{\,0}$

$F^N_{I1y} - F^g_{E1y} = 0$

$|\vec{F}^N_{I1}| - |\vec{F}^g_{E1y}|\cos(\theta) = 0$

$|\vec{F}^N_{I1}| = m_1 g \cos(\theta)$

$\Sigma F_x = m_1 a_{1x}^{\,0}$

$-|\vec{F}^{Fs,max}_{I1}| + |\vec{F}^g_{E1}|\sin(\theta) = 0$

$\mu_s |\vec{F}^N_{I1}| = m_1 g \sin(\theta)$

$\mu_s (m_1 g \cos(\theta)) = m_1 g \sin(\theta)$

$\mu_s = \tan(\theta)$

$\mu_s = \tan(27) \approx 0.51$