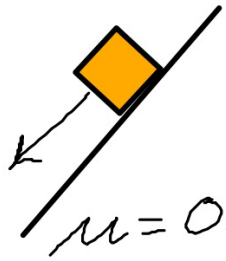
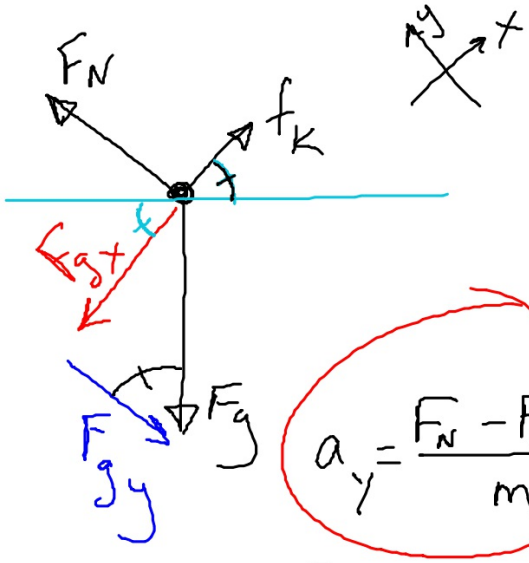
73



$a = ?$

$\mu = 0.2$

$\theta = 60°$



$$a_x = \frac{f_k - F_{gx}}{m}$$

$$a_y = \frac{F_N - F_{gy}}{m}$$

$$a_x = \frac{\mu F_N - mg\sin\theta}{m}$$

$$0 = \frac{F_N - mg\cos\theta}{m}$$

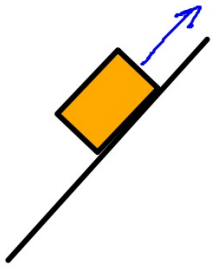
$$F_N = mg\cos\theta$$

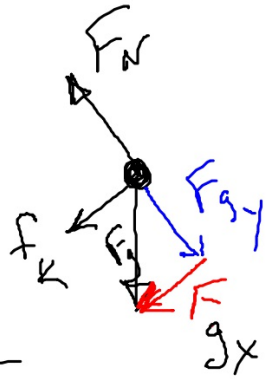
$$a_x = \frac{\mu mg\cos\theta - mg\sin\theta}{m}$$

$$a_x = \frac{mg(\mu\cos\theta - \sin\theta)}{m}$$

$$a_x = 9.8(0.2\cos 60^\circ - \sin 60^\circ)$$

$$= -7.5\,m/s^2$$ (accelerates down hill at $7.5\,m/s^2$)





$a = ?$

from before

$F_N = mg\cos\theta$

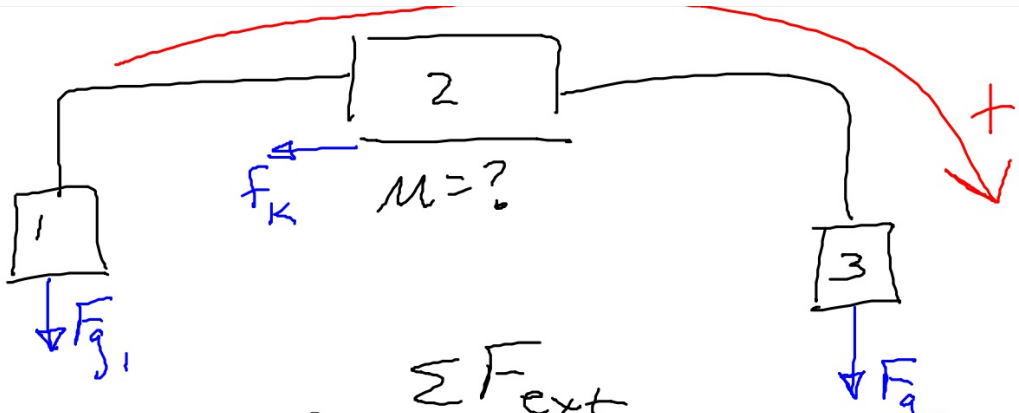
$$a_x = \frac{-f_k - F_{gx}}{m}$$

$$a_x = \frac{-\mu F_N - mg\sin\theta}{m} = \frac{-\mu mg\cos\theta - mg\sin\theta}{m}$$

$$a_x = \frac{-mg(\mu\cos\theta + \sin\theta)}{m} = -9.8(0.2\cos 60° + \sin 60°$$

$$= -9.5\ m/s^2$$

23.



$m_1 = M$

$m_2 = 2M$

$m_3 = 2M$

$a = 0.5 m/s^2$

$$a = \frac{\Sigma F_{ext}}{m_{total}}$$

$f = \mu F_N \quad F_{N_2} = F_{g_2}$

$$a = \frac{F_{g_3} - F_{g_1} - f_k}{5M} = \frac{2Mg - Mg - \mu(2Mg)}{5M}$$

$$a = \frac{M(2g - g - 2\mu g)}{5M}$$

$$a = \frac{g - 2\mu g}{5}$$

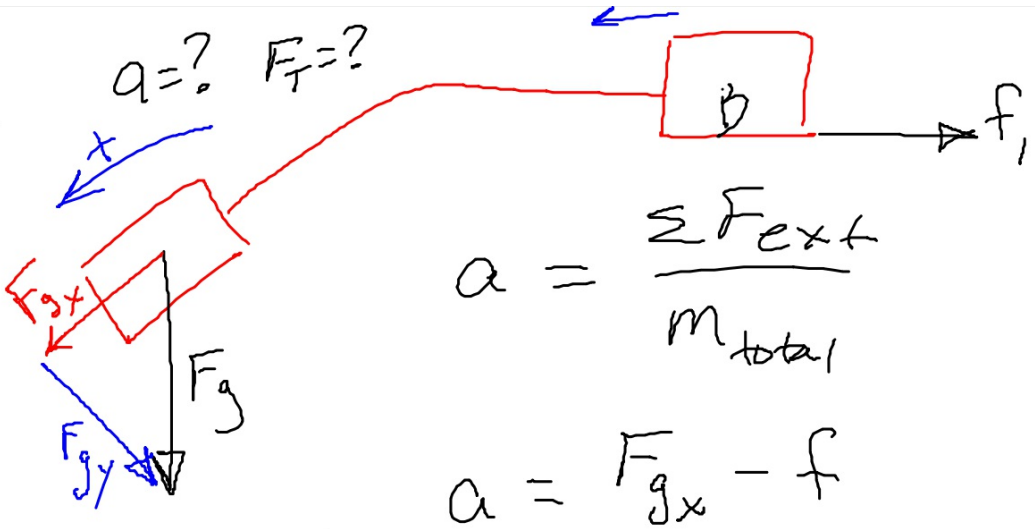
$$\frac{5a}{g} = 1 - 2\mu$$

$$\frac{5a}{g} - 1 = -2\mu$$

$$\frac{1}{2} - \frac{5a}{2g} = \mu$$

$$\frac{1}{2} - \frac{5}{4g} = \mu = 0.372$$

79. $a=?$ $F_T=?$



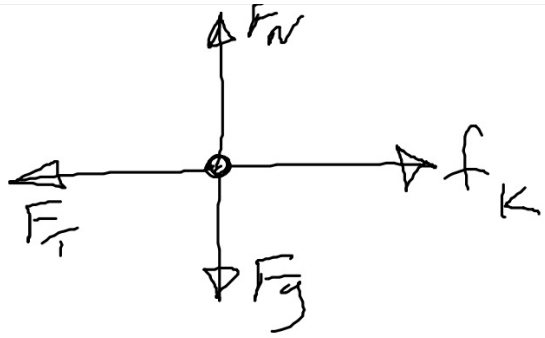
$$a = \frac{\Sigma F_{ext}}{m_{total}}$$

$$a = \frac{F_{g_x} - f}{m_A + m_B}$$

$$a = \frac{m_A g \sin\theta - \mu F_{N_B}}{m_A + m_B}$$

$$F_{N_B} = F_{g_B} = m_B g$$

$$a = \frac{4(9.8)\sin 30° - (0.5)(2)(9.8)}{6} = 1.6\ m/s^2$$

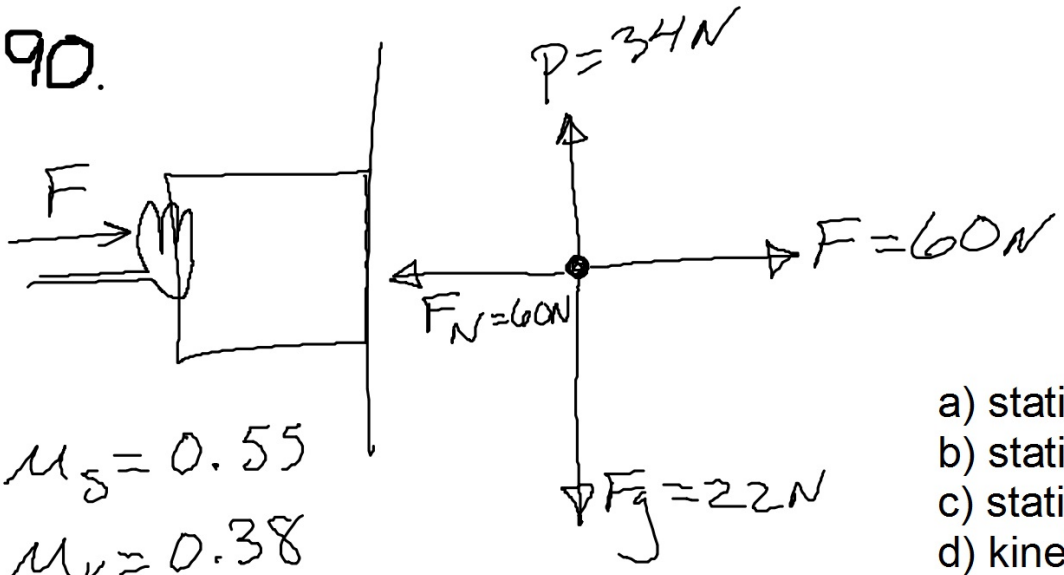


$$a_x = \frac{f - F_T}{m_B}$$

$$-1.6 = \frac{(0.5)(19.6) - F_T}{2}$$

$$F_T = 13\,N$$

90.



$\mu_s = 0.55$

$\mu_K = 0.38$

a) static 12N down
b) static 10N up
c) static 26N down
d) kinetic 22.8N down
e) static 32N up
f) kinetic 22.8N up

$f_{s(max)} = \mu_s F_N$

$= (0.55)(60) = 33N$

$f_K = \mu_K F_N = (0.38)(60) = 22.8N$