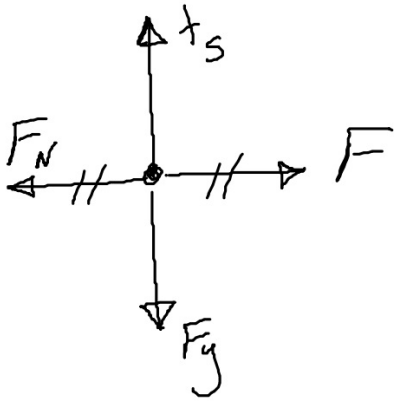
19. Is $F_g \geq f_s(max)$?

$F = 12N$ $F_g = 5N$ $\mu_s = 0.60$ $\mu_k = 0.40$



$f_s(max) = \mu_s F_N$

$= (0.6)(12) = 7.2N$

$F_g < f_s(max)$ so, it don't slide!

$F - F_N = ma_x$

$a_x = 0$

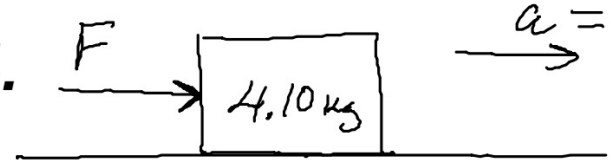
$F = F_N$

$F = ?$ (from wall on block)

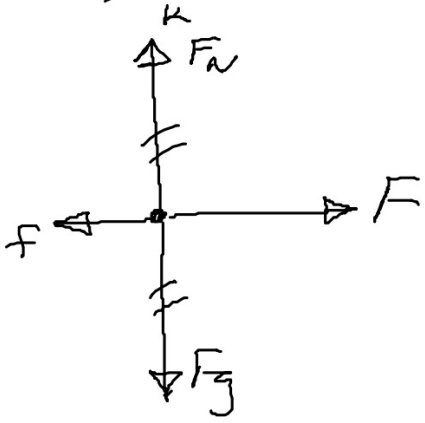
$= F_N + f_s$

$= -12N\,\hat{i} + 5N\,\hat{j}$

24.



$\mu_K = ?$



$$F - f_K = ma_x$$

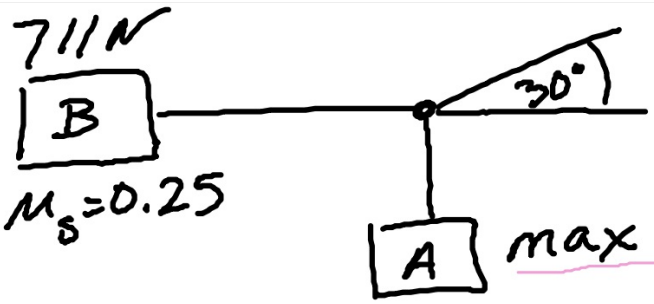
$$F - \mu_K F_N = ma_x$$

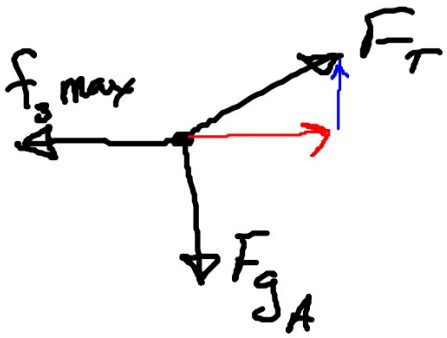
$$F - ma_x = \mu_K F_N$$

$$\frac{F - ma_x}{mg} = \mu_K$$

$$\frac{40 - (4.1)(4.5)}{(4.1)(9.8)} = \mu_K \quad = 0.536$$

25.





$$a_x = \frac{F_T \cos 30^\circ - f_{s\,max}}{m} \qquad a_x = 0$$

$$\text{so } F_T = \frac{\mu_s F_{N_B}}{\cos 30^\circ}$$

$$a_y = \frac{F_T \sin 30^\circ - F_{g_A}}{m}$$

$$F_g = \left(\frac{\mu_s F_{N_B}}{\cos 30^\circ}\right) \sin 30^\circ$$

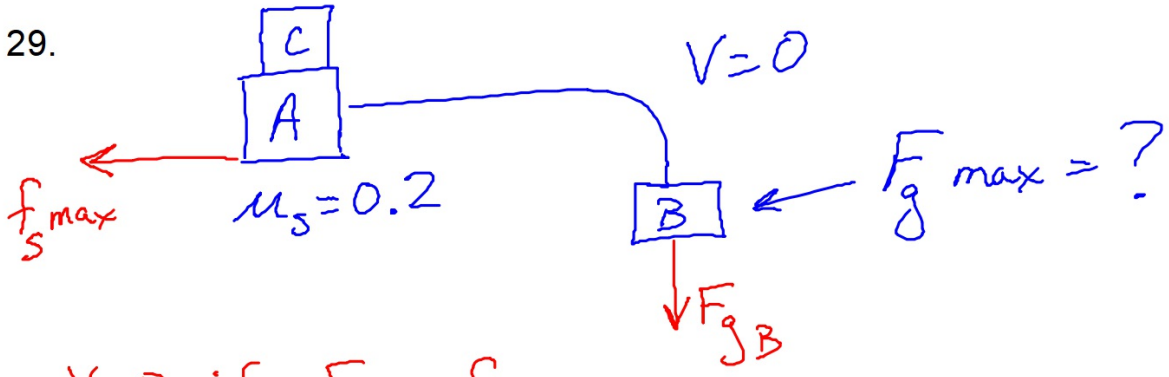
$a_y = 0$ so $F_g = F_T \sin 30^\circ$

$$F_g = \mu_s F_{N_B} \tan 30^\circ$$

$$= (0.25)(711) \tan 30^\circ =$$

$$F_{g_A} = 103\ N$$

29.



$V=0$ if $F_{g_B} = f_{s\,max}$

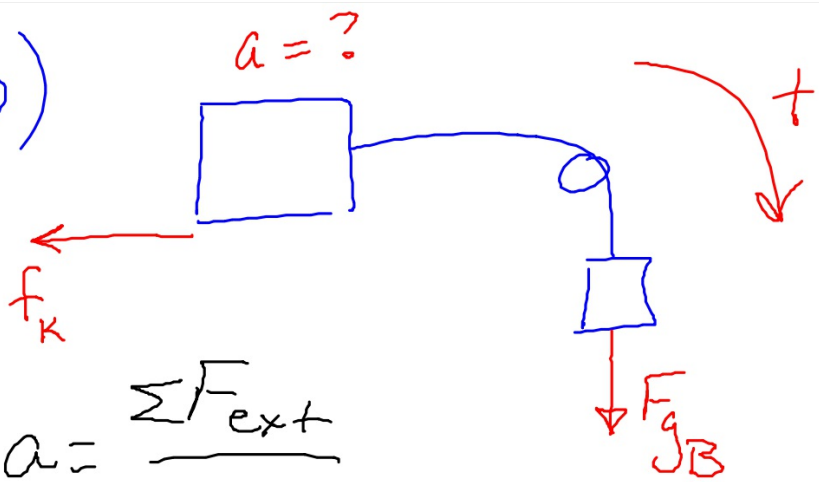
$f_{s\,max} = \mu_s F_N$

$22 = (0.2)(44 + F_{g_C})$

$F_{g_C} + F_{g_A} = F_N$ on A

$F_{g_C} = 66\ N$

b)



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

$$a = \frac{F_{g_B} - f_K}{m_A + m_B} = \frac{m_B g - \mu_K F_{N_A}}{m_A + m_B} = \frac{22 - (0.15)(44)}{6.73\,kg}$$

$$a = 2.3\,m/s^2$$

100. old ski:

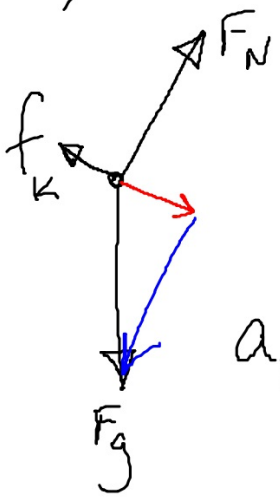
a) $a = ?$ $V_0 = 0$ $\Delta r = 200\,m$ $t = 60\,s$

$$\Delta r = V_0 t + \tfrac{1}{2} a t^2$$

$$200 = 0 + \tfrac{1}{2} a (60)^2 \quad a = 0.107\,m/s^2$$

b) $a = ?$ $200 = 0 + \tfrac{1}{2} a (42)^2$ $a = 0.227\,m/s^2$

c) + d) $\mu = ?$



$$a_x = \frac{F_{gx} - f_K}{m} \qquad a_y = \frac{F_N - F_{gy}}{m}$$

$$a_x = \frac{mg\sin\theta - \mu F_N}{m} \qquad a_y = 0$$

So $F_N = F_{gy} = mg\cos\theta$

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

$$a_x = g(\sin\theta - \mu\cos\theta) \qquad \mu = \frac{-a}{g\cos\theta} + \tan\theta$$

$$\mu_{old} = \frac{-0.107}{g\cos 3^\circ} + \tan 3^\circ \approx 0.0414$$

$$\mu_{new} = \frac{-0.227}{g\cos 3^\circ} + \tan 3^\circ \approx 0.029$$