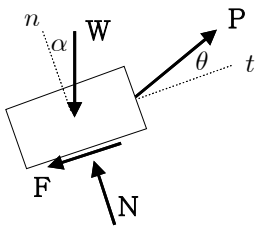
<8.1~8.2절>

8.4 P = 62.5 N, θ = 15°, α = 20°, μ_s = 0.30, μ_k = 0.25

W = (10 kg)(9.81 m/s^2) = 98.1 N



↖ΣF_n = 0

$N - W\cos\alpha + P\sin\theta = 0$

⇒ $N = W\cos\alpha - P\sin\theta$

= (98.1 N) cos20° − (62.5 N) sin15°

= 76.01 N

$F_{max} = \mu_s N$ = (0.30)(76.01 N) = 22.80 N

↗ΣF_t = 0

$-F - W\sin20° + P\cos\theta = 0$

⇒ $F = -W\sin20° + P\cos\theta$

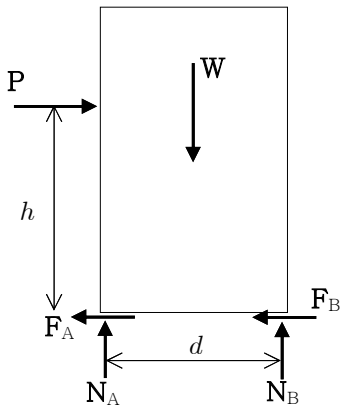
= −(98.1 N) sin20° + (62.5 N) cos15° = 26.82 N

부호 → 마찰력 방향

$F_{max} < F$ 불가능 ⇒ 평형상태 아님 ⇒ 미끄러져 올라감

$F = \mu_k N$ = (0.25)(76.01 N) = 19.002 N **F** = 19.00 N ↙20.0°

8.18 W = 480 N, μ_s = 0.30, d = 0.6 m



(a) $F_A = \mu_s N_A$, $F_B = \mu_s N_B$

↑ΣF_y = 0

$N_A + N_B - W = 0$

⇒ $N_A + N_B = W$

→ΣF_x = 0

$P - F_A - F_B = 0$

⇒ $P = F_A + F_B = \mu_s N_A + \mu_s N_B$

$= \mu_s (N_A + N_B) = \mu_s W$

= (0.30)(480 N) = 144 N

P = 144.0 N→

(b) 넘어지려는 순간 N_A = 0, F_A = 0

↺ΣM_B = 0

$h P - \frac{d}{2} W = 0$

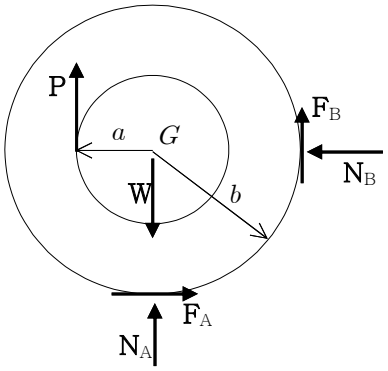
⇒ $h = \frac{d}{2}\frac{W}{P}$ = (0.3 m)$\frac{480\text{ N}}{144\text{ N}}$ = 1.000 m h_{max} = 1.000 m

8.19 $W = 100$ N, $\mu_s = 0.40$, $\mu_k = 0.30$

$a = 0.075$ m, $b = 0.150$ m

운동마찰 (돌고 있으므로)

$F_A = \mu_k N_A$, $F_B = \mu_k N_B$



$\rightarrow \Sigma F_x = 0$; $F_A - N_B = 0$

$\Rightarrow \quad N_B = F_A = \mu_k N_A$

$F_B = \mu_k N_B = \mu_k(\mu_k N_A) = \mu_k^2 N_A$

$\uparrow \Sigma F_y = 0$; $P + N_A + F_B - W = 0$

$\Rightarrow \quad P + N_A + \mu_k^2 N_A - W = 0$

$\Rightarrow \quad (1+\mu_k^2) N_A = W - P$

$\circlearrowleft \Sigma M_G = 0$; $a\ P - b\ F_A - b\ F_B = 0$

$\Rightarrow \quad P = \dfrac{b}{a}(F_A + F_B) = \dfrac{b}{a}(\mu_k N_A + \mu_k^2 N_A) = \dfrac{b}{a}(\mu_k + \mu_k^2) N_A$

$= \dfrac{b}{a}(\mu_k + \mu_k^2)\dfrac{W-P}{1+\mu_k^2} = \dfrac{b}{a}\dfrac{\mu_k + \mu_k^2}{1+\mu_k^2}(W - P)$

$\Rightarrow \quad a(1+\mu_k^2)\ P = b(\mu_k + \mu_k^2)(W - P)$

$\Rightarrow \quad [a(1+\mu_k^2) + b(\mu_k + \mu_k^2)]\ P = b(\mu_k + \mu_k^2)\ W$

$\Rightarrow \quad P = \dfrac{b(\mu_k + \mu_k^2)}{a(1+\mu_k^2) + b(\mu_k + \mu_k^2)} W$

$= \dfrac{(0.150\text{ m})(0.30 + 0.30^2)}{(0.075\text{ m})(1 + 0.30^2) + (0.150\text{ m})(0.30 + 0.30^2)}(100\text{ N}) = 41.7\text{ N}$