

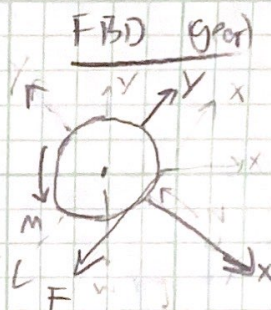
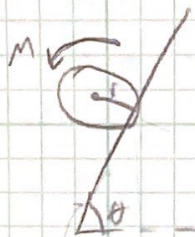
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Given

- $m = 75 \text{ kg}$
- $\theta = 60^\circ$
- $\mu_s = 0.10$
- $\mu_k = 0.05$
- 75 mm diameter,
0.0375 m radius

Find

Moment M for
steady moment
of rack



$$\sum M = 0$$

$$F_r M - F_r r = 0$$

$$M = F_r$$

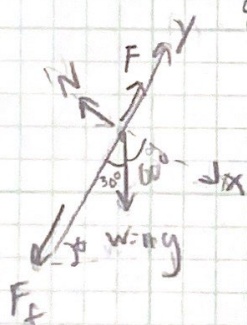
$$M_{\text{down}} = 656.24(0.0375)$$

$$M_{\text{down}} = 24.61 \text{ N}\cdot\text{m}$$

$$M_{\text{up}} = 619.42(0.0375)$$

$$M_{\text{up}} = 23.23 \text{ N}\cdot\text{m}$$

FBD (rack) (moving down)



$$\sum F_x = 0$$

$$mg \cos(60) = N$$

$$N = (75)(9.82) \cos(60)$$

$$N = 366.25$$

$$\sum F_y = 0$$

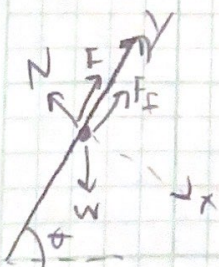
$$F_f = \mu_k N = 366.25(0.05)$$

$$F - F_f - mg \cos(30) = 0$$

$$F = 18.41 + 637.63$$

$$F = 656.24 \text{ N}$$

Moving up



$$N = 366.25$$

$$F_{fk} = 18.41$$

$$\sum F_y = 0$$

$$F + F_f - mg \cos(30) = 0$$

$$F = 619.42$$

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Given

$M = CW$ couple

diagram

$$m_B = 3 \text{ kg}$$

$$m_C = 6 \text{ kg}$$

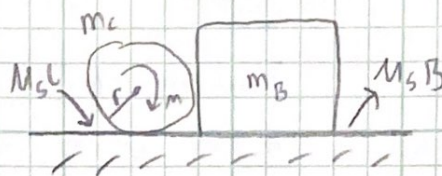
$$\mu_{sB} = 0.50$$

$$\mu_{sC} = 0.40$$

$$r = 0.2 \text{ m}$$

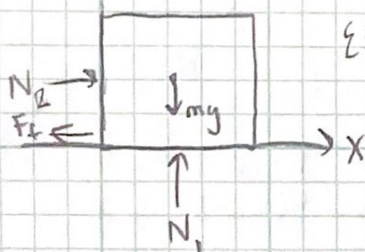
Find

value of M to
initiate motion



FB D #1 (m_B)

$y \uparrow$

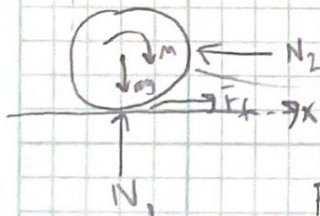


$$\sum F_y = 0; N_1 = mg = 3(9.82) = 29.46$$

$$\sum F_x = 0; N_2 = F_f = \mu_s N_1 = 0.50(29.46) = 14.73$$

FB D #1 (m_C)

$n \downarrow$



$$\sum F_y = 0$$

$$N_1 = mg = 6(9.82) = 58.92$$

$$\sum F_x = 0$$

$$F_f = N_2 = 14.73 \text{ N}$$

$$\sum M_C = 0$$

$$M = F_f (r)$$

$$M = 14.73(0.2)$$

$$M = 2.94 \text{ N}\cdot\text{m}$$

6/30

Given

$$m_A = 2 \text{ kg}$$

$$m_B = 3 \text{ kg}$$

$$P = 50 \text{ N}$$

$$\theta = 40^\circ$$

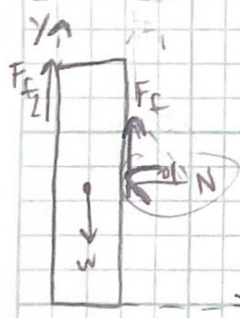
$$\mu_{s1} = 0.70$$

$$\mu_{s2} = 0.50$$

$$\mu_{k1} = 0.525$$

$$\mu_{k2} = 0.375$$

FBD (B)

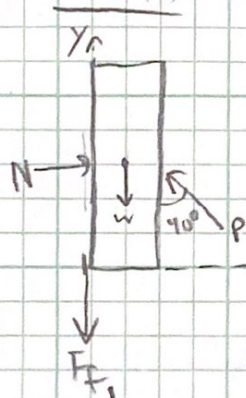


Find

Force (mag & dir)

A exerts on B

FBD (A)



$$\sum F_x = 0$$

(Block A is static)

$$N - P \sin(40) = 0$$

$$N = 50 \sin(40) = 32.14 \text{ N}$$

$$\sum F_y = 0$$

$$P \cos(40) - w - F_s = 0$$

$$F_s = 50 \cos(40) - 2(9.8)$$

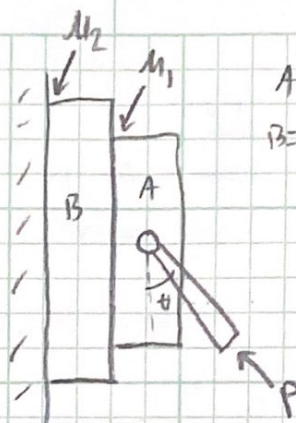
$$F_s = 18.66$$

$22.49 > 18.66$, doesn't slide

$$F_{AB} = \sqrt{18.66^2 + 32.14^2}$$

$$F_{AB} = 37.39 \text{ N}$$

$$\tan^{-1}\left(\frac{18.66}{32.14}\right) = 29.94^\circ \text{ north of west}$$



A = moving up

B = wants to slide down