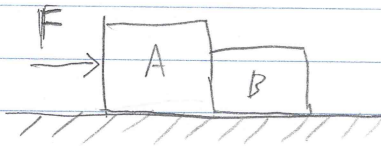


20-P-MOM-DY-23

Block A & B, with mass $m_A = 15 \text{ kg}$ and $m_B = 10 \text{ kg}$ respectively, are subject to the force $F = 150 \text{ N}$. The boxes have a coefficient of friction $\mu = 0.35$ with the floor. Determine the final velocity of the boxes when time $t = 4 \text{ s}$ and the force exerted by box A onto B at rest



Solution:

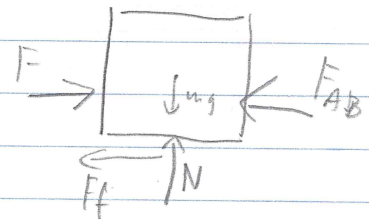
Block A

$$\sum F_y: m_A a_y = m_A g - N = 0 \quad N = m_A g$$

$$m_A v_1 + \sum \int_{t_1}^{t_2} F dt = m_A v_2$$

$$m_A v_1 + F t \Big|_0^4 - \mu N t \Big|_0^4 - F_{AB} t \Big|_0^4 = m_A v_2$$

$$v_2 = 26.266 - 0.766 F_{AB}$$



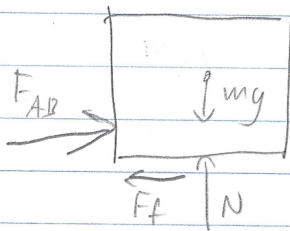
Block B

$$\sum F_y: N = m_B g$$

$$m_B v_1 + \sum \int_{t_1}^{t_2} F dt = m_B v_2$$

$$F_{AB} t \Big|_0^4 - \mu N t \Big|_0^4 = m_B v_2$$

$$v_2 = 0.4 F_{AB} - 13.734$$



$$0.666 F_{AB} = 40$$

$$F_{AB} = 60.1 \text{ N}$$

$$v_2 = 10.306 \text{ m/s}$$