

Work Energy II - Problem 3

The two crates are released from rest. Their masses are  $m_A = 40 \text{ kg}$  and  $m_B = 30 \text{ kg}$ , and the kinetic coefficient of friction between crate  $A$  and the inclined surface is  $\mu_k = 0.15$ . What is the magnitude of the velocity of the crates when they have moved 400 mm?

CLASSIFY MOTION

BOTH CRATES TRANS

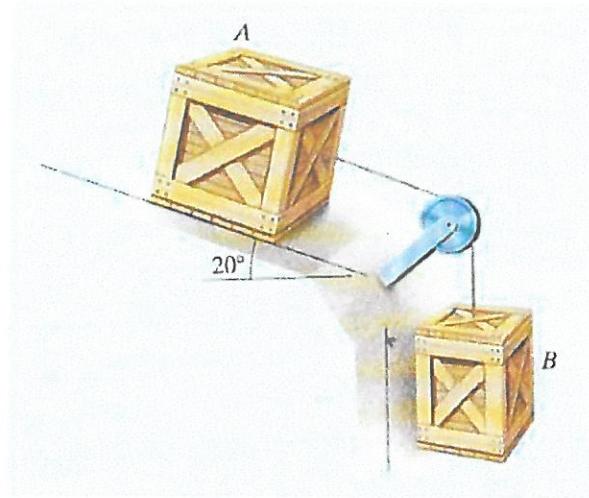
PROPERTIES

$$m_A = 40 \text{ kg}$$

$$W_A = 392 \text{ N}$$

$$m_B = 30 \text{ kg}$$

$$W_B = 294 \text{ N}$$



WHAT DOES WORK?

WEIGHT OF BOTH CRATES

FRICTION ON CRATE A

$$U_{WA} = W_A \cdot \Delta y = 392 (0.4 \sin 20^\circ) = 53.6 \text{ J}$$

$$U_{WB} = W_B \cdot \Delta y = 294 (0.4) = 117.6 \text{ J}$$

$$U_{FR} = -\mu_k N d = -0.15 (392 \cos 20^\circ) (0.4) = -22.1 \text{ J}$$

$$U_{1-2} = 53.6 + 117.6 - 22.1 = 149.1 \text{ J}$$

WORK-ENERGY

$$T_1 + U_{1-2} = T_2 \quad (\text{@ REST, } \therefore T_1 = 0)$$

$$149.1 = \frac{1}{2} (40) V_A^2 + \frac{1}{2} (30) V_B^2$$

BUT  $V_A = V_B = V$

$$V = 2.07 \text{ mps}$$