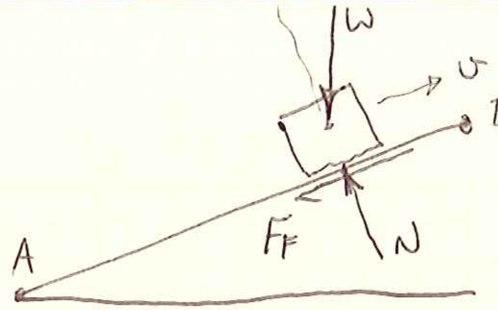
PROB. 13-10

$v_A = 8\,\frac{m}{s}$, $\mu_K = 0.12$, FIND $d$




$$T_A + {}_A U_B = T_B$$

$T_B = 0$ SINCE $v_B = 0$

$$T_A = \frac{1}{2} m v_A^2 = \frac{1}{2}\left(\frac{W}{g}\right) v_A^2$$

$$_A U_B = F\cos\alpha \cdot \Delta x = -F_F \cdot d - W\sin 15^\circ \cdot d$$

$$= -\mu W \cos 15^\circ \cdot d - W \sin 15^\circ \cdot d$$

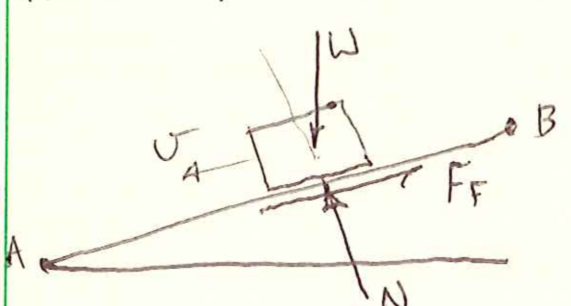
$$= -Wd(\mu\cos 15^\circ + \sin 15^\circ)$$

$$\frac{1}{2}\left(\frac{W}{g}\right) v_A^2 - Wd(\mu\cos 15^\circ + \sin 15^\circ) = 0$$

$$d = \frac{v_A^2}{2g(\mu\cos 15^\circ + \sin 15^\circ)}$$

$$d = \frac{\left(8\,\frac{m}{s}\right)^2}{2\left(9.81\,\frac{m}{s^2}\right)\left[(0.12)\cos 15^\circ + \sin 15^\circ\right]} \boxed{= 8.704\ m}$$

FIND $v_A$ WHEN BOX SLIDES DOWN




$$T_B + {}_B U_A = T_A$$

$T_B = 0$ SINCE $v_B = 0$

$$T_A = \frac{1}{2} m v_A^2 = \frac{1}{2}\left(\frac{W}{g}\right) v_A^2$$

TOPS. 35500

PROB. 13-10 CONT.

$${}_{B}U_{A} = F\cos\alpha \cdot \Delta x = -F_F \cdot d + W \sin 15^\circ \cdot d$$

$$= -\mu W \cos 15^\circ \cdot d + W \sin 15^\circ \cdot d$$

$$= Wd(-\mu \cos 15^\circ + \sin 15^\circ)$$

$$Wd(-\mu \cos 15^\circ + \sin 15^\circ) = \frac{1}{2}\left(\frac{W}{g}\right)v_A^2$$

$$v_A = \sqrt{2gd(-\mu \cos 15^\circ + \sin 15^\circ)}$$

$$v_A = \sqrt{2\left(9.81\ \frac{m}{s^2}\right)(8.704\ m)\left[-(0.12)\cos 15^\circ + \sin 15^\circ\right]}$$

$$\boxed{v_A = 4.940\ \frac{m}{s}}$$