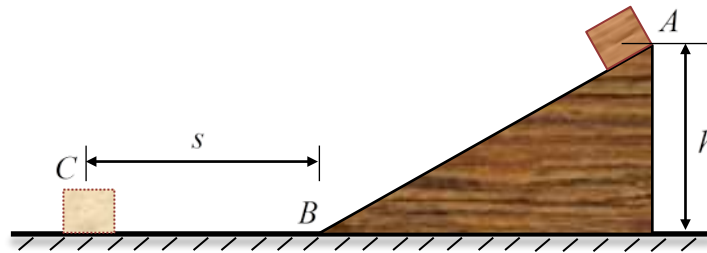
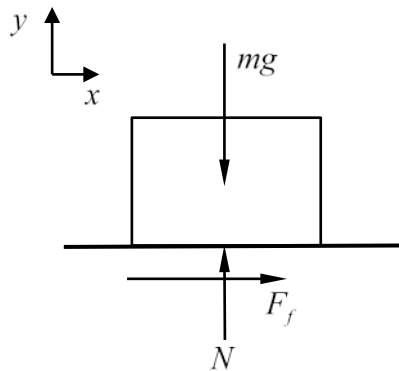


2-7. The  $m = 20$  kg box  $A$  is released from rest and slides along the smooth fixed ramp and onto the surface of ground. If the coefficient of kinetic friction between the ground surface and the box is  $\mu_k = 0.5$ , and the height of the smooth ramp follows a normal distribution  $h \sim N(3, 0.1^2)$  m, determine the distribution of distance  $s$  that the box traveled on the ground when the box stops.



Solution



**Principle of Work and Energy:**

$$T_A + \Sigma U_{A-C} = T_C$$

$$0 + mgh - F_f \cdot s = 0$$

$$mgh - \mu_k mgs = 0$$

$$\Rightarrow s = \frac{h}{\mu_k}$$

Thus,

$$\mu_s = \frac{\mu_h}{\mu_k} = \frac{3}{0.5} = 6 \text{ m} \quad \text{Ans.}$$

$$\sigma_s = \frac{1}{\mu_k} \sigma_h = \frac{1}{0.5} (0.1) = 0.2 \text{ m} \quad \text{Ans.}$$