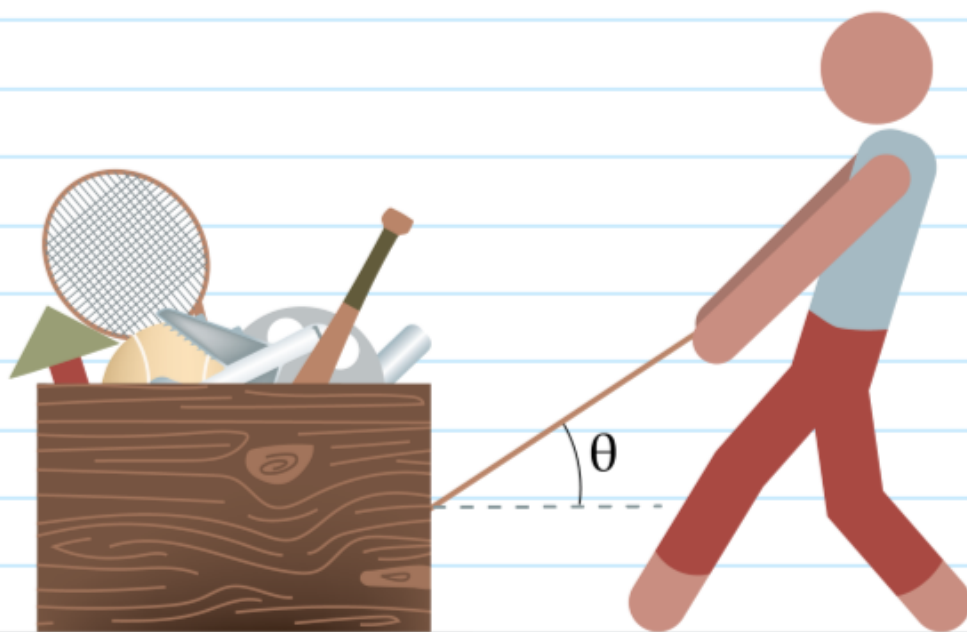


21-P-WE-GD-002

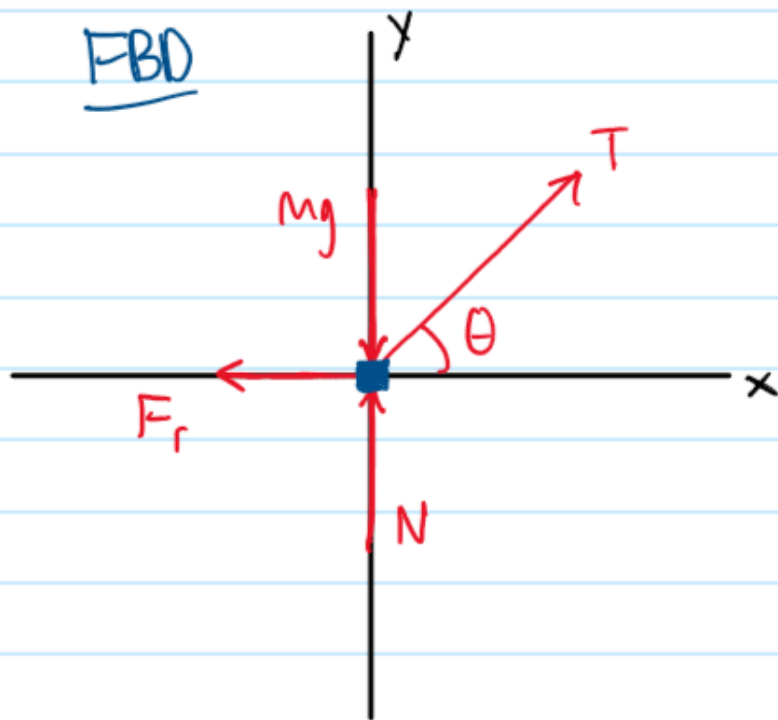


A child is pulling a box of toys across the floor. The box has a mass of  $m$  kg and a coefficient of kinetic friction with the floor of  $\mu_k$ . If the child pulls the box with a force of  $F$ , at an angle of  $\theta$  above the horizontal and the box travels  $s$  m, what is the work done by the resulting force?

(Assume  $g = 9.81 \text{ m/s}^2$ , neglect the size of the box)

given  $m, s, g, \mu, T, \theta$  FBD

find  $W$



Force Equilibrium

$$\sum F_x = ma_x = T \cos \theta - F_r$$

$$\sum F_y = m \overset{0}{\cancel{a}_y} = T \sin \theta + N - mg$$

$$N = mg - T \sin \theta \quad F_r = \mu N = \mu (mg - T \sin \theta)$$

Resultant Force

$$R = T \cos \theta - F_r$$

Work

$$\underline{W = R s} = (T \cos \theta - \mu (mg - T \sin \theta)) s$$