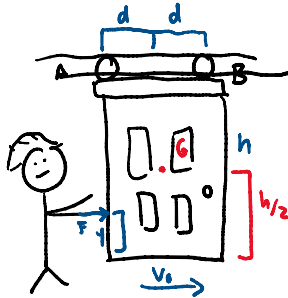


20-R-KIN-DK-14 Beginner Translation (RBLK)

Inspiration: 17-24 Hibbeler



An engineering student gets a co-op job at a door factory. They transport a door by pushing one on its side with a horizontal force of $F = 200 \text{ N}$. If the door has a mass of $m = 16 \text{ kg}$ and initial velocity $v_0 = 0.05 \text{ m/s}$, how far would it travel in $t = 5 \text{ seconds}$? What are the reaction forces at A and B?

The center of gravity is an equal distance $d = 0.4 \text{ m}$ away from rollers A and B.

The door has a height $h = 2.3 \text{ m}$ and the center of gravity is found at $h/2$.

The student applies the force at a height $y = 0.8 \text{ m}$ from the bottom of the door.

$$\begin{aligned}\sum F_x &= m a_{Gx} = 200 \\ &= 16 a_{Gx} = 200 \quad a_{Gx} = 12.5\end{aligned}$$

$$\sum F_y = 16 a_{Gy} = F_A + F_B - (16)(9.81) = 0$$

$$\sum M_A = F_B(0.4) + F(1.5) - (16)(9.81)(0.4) = 0$$

$$F_B(0.4) = 32.784 \quad F_B = 40.98 \text{ X}$$

$$F_A = 115.98 \text{ X}$$

$$F_B(0.4) = (16)(9.81)(0.4) - 200(1.5)$$

$$F_B = -296.52 \text{ N} \quad \checkmark$$

$$F_A = 453.48 \text{ N} \quad \checkmark$$

$$s = s_0 + v_0 t + \frac{1}{2} a_G t^2$$

$$\begin{aligned}s &= (0.05)(5) + \frac{1}{2} (12.5)(5)^2 \\ &= 156.5 \text{ m}\end{aligned}$$