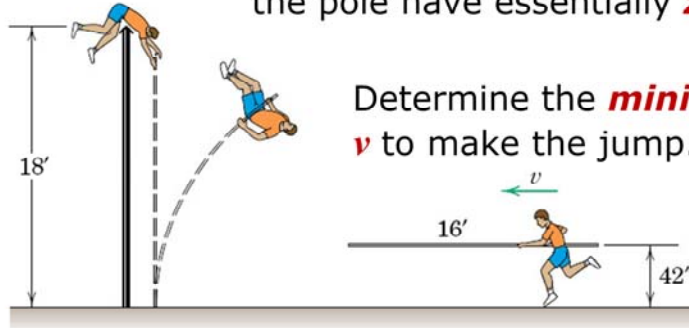


Work-Energy: Exercise 3

A **175-lb** pole vaulter carrying a uniform **16-ft, 10-lb** pole approaches the jump with a **velocity v** and barely clears the bar **height of 18 ft** when he and the pole have essentially **zero velocity**.



Determine the **minimum** value of **v** to make the jump.

ME 231: Dynamics

$$3/171 \quad U_{1-2}' = 0 \quad \text{so} \quad T_1 + V_{g1} = T_2 + V_{g2}$$

Take datum $V_g = 0$ at ground level.

$$T_1 = \frac{1}{2} \frac{175 + 10}{32.2} v^2 = 2.87 v^2, \quad T_2 = 0$$

$$V_{g1} = (175 + 10) \frac{42}{12} = 648 \text{ ft}\cdot\text{lb}$$

$$V_{g2} = 175(18) + 10(8) = 3230 \text{ ft}\cdot\text{lb}$$

$$\text{So } 2.87 v^2 + 648 = 0 + 3230$$

$$\underline{v = 30.0 \text{ ft/sec}} \quad \text{or} \quad \underline{20.4 \text{ mi/hr}}$$