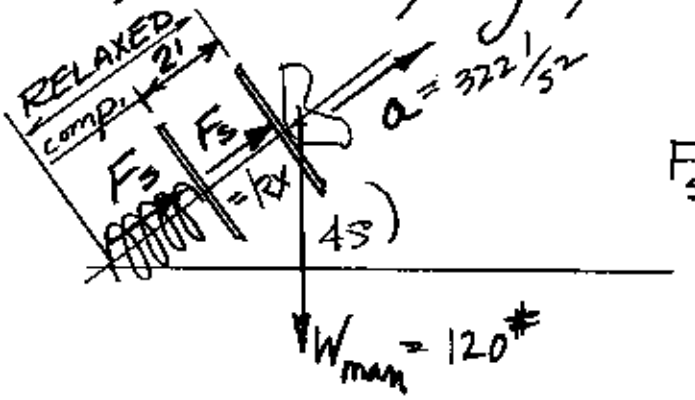
HIBBELER

14-30

# HUMAN CANNONBALL

This is not a Static Analysis, but definitely DYNAMIC because that man goes flying from that spring force.




$$\Sigma \vec{F}_{on\ man} = m\vec{a}$$

$$F_s - W\cos 45^\circ = \frac{W}{g}\vec{a}$$

where $F_s = kx = k(2')$

$$k(2') = 120^{\#}\sin 45^\circ + \left(\frac{120\ lb_m}{32.2\ \frac{lb_m}{lb_f}}\right)\left(322\ \frac{1}{s^2}\right)\frac{1}{s^2}$$

$$k = 642.43\ \frac{lb_f}{ft} = \boxed{53.53\ \frac{lb_f}{in.} = k}$$

? EXIT VELOCITY @ $d = 8'$

$PE_i$ STORED IN SPRING $= \frac{1}{2}kx^2 = \frac{1}{2}\left(642.43\ \frac{lb}{ft}\right)(2')^2$

$= 1.285 \times 10^3$ ft. lb.

$PE_f = (F_{man})d = (120^{\#}\sin 45^\circ)(8') = 678$ ft. lb.

$KE_i = 0$, $KE_f = \frac{1}{2}mV^2 = \frac{1}{2}\left(\frac{120\ lb_f}{32.2\ ft/s^2}\right)V^2$

$PE_1 - PE_2 = KE_2 - KE_1$

$1285 - 678 = \frac{60}{32.2}V^2$

$\therefore \boxed{V = 18.05\ \frac{ft}{s}}$