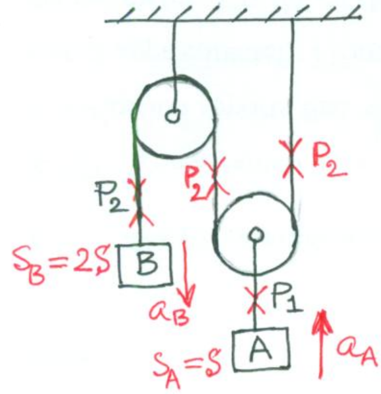
#1144/P. 329 (Using Energy Principles)




$W_A = 120$ lb  $W_B = 80$ lb

$a_A = ?$  $a_B = ?$

$P_1 = ?$  $P_2 = ?$

Sol^n

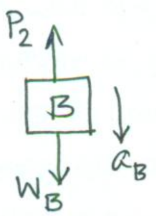
From observation it is understood that A moves upward and B moves downward.

For the whole system

$$U_{net} = W_B \cdot S_B - W_A \cdot S_A$$
$$= 80 \times 2S - 120 \times S$$
$$= 40S$$

$$\Delta KE = \frac{1}{2}\frac{W_A}{g}v_A^2 + \frac{1}{2}\frac{W_B}{g}\cdot v_B^2$$
$$= \frac{1}{2}\cdot\frac{120}{32.2}v_A^2 + \frac{1}{2}\cdot\frac{80}{32.2}v_B^2$$
$$= 1.86\,v_A^2 + 1.24 \times (2v_A)^2 \quad [\text{Substituting } v_B = 2v_A]$$
$$= 6.82\,v_A^2$$
$$= 6.82 \times 2a_A S \quad [\because v_A^2 = 2a_A S]$$
$$= 13.64\,a_A S$$

$$U_{net} = \Delta KE$$
$$\Rightarrow 40S = 13.64\,a_A S$$
$$\therefore a_A = \boxed{2.93 \text{ fps}^2} \text{ Ans.}$$
$$a_B = 2a_A = 2 \times 2.93 = \boxed{5.86 \text{ fps}^2} \text{ Ans.}$$




From the freebody of B, $\Sigma F_y = ma \downarrow +ve$ gives

$$W_B - P_2 = \frac{W_B}{g}\cdot a_B$$
$$\Rightarrow 80 - P_2 = \frac{80}{32.2} \times 5.86$$
$$\therefore P_2 = \boxed{65.44 \text{ lb}} \text{ Ans.}$$
$$\therefore P_1 = 2P_2 = 2 \times 65.44 = \boxed{130.88 \text{ lb}} \text{ Ans.}$$