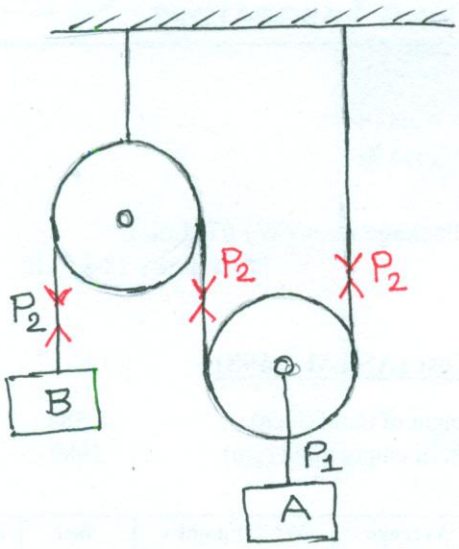
1144/P. 329



$W_A = 120$ lb

$W_B = 80$ lb

Chord and pulleys are weightless & frictionless

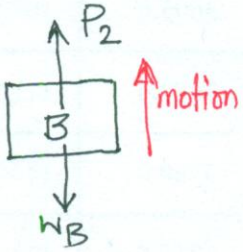
$a_A = ?$ $a_B = ?$

$P_1 = ?$ $P_2 = ?$

Soln

Since $W_A > W_B$, let's assume that A moves downward and B moves upward.

Here $P_1 = 2P_2$ and $a_B = 2a_A$



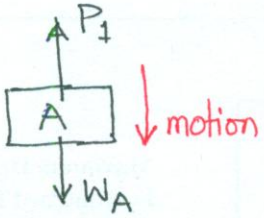
From the freebody of B,

$\Sigma F_V = m_B a_B \quad \uparrow +ve$

$\Rightarrow P_2 - W_B = \frac{W_B}{g} \cdot a_B$

$\Rightarrow \frac{P_1}{2} - 80 = \frac{80}{32.2} \times 2a_A$

$\therefore P_1 = 9.94\, a_A + 160$ ——— (1)



From the freebody of A

$\Sigma F_V = m_A a_A \quad \downarrow +ve$

$\Rightarrow W_A - P_1 = \frac{W_A}{g} \cdot a_A$

$\Rightarrow 120 - P_1 = \frac{120}{32.2} \times a_A$

$\Rightarrow 120 - 9.94\, a_A - 160 = 3.73\, a_A$ [substituting P_1 from (1)]

$\therefore a_A = -2.926$ fps^2, −ve sign implies that A moves upward

$\therefore a_B = 2a_A = 2 \times 2.926 = 5.852$ fps^2

From eqn (1) $P_1 = 9.94 \times (-2.962) + 160 = 130.92$ lbs

and $P_2 = P_1/2 = 65.46$ lb

Note: Since these bodies are moving from rest, their velocity and accln are in the same sense/direction.