3. (*a*) Consider the person and platform a system for angular momentum analysis. Since the force and torque to raise and/or lower the arms is internal to the system, the raising or lowering of the arms will cause no change in the total angular momentum of the system. However, the rotational inertia increases when the arms are raised. Since angular momentum is conserved, an increase in rotational inertia must be accompanied by a decrease in angular velocity.

(*b*) $L_i = L_f \rightarrow I_i\omega_i = I_f\omega_f \rightarrow I_f = I_i\frac{\omega_i}{\omega_f} = I_i\frac{0.90\,\text{rev/s}}{0.70\,\text{rev/s}} = 1.286\,I_i \approx 1.3\,I_i$

The rotational inertia has increased by a factor of $\boxed{1.3}$.

41. (*a*) We assume the system is moving such that mass B is moving down, mass A is moving to the left, and the pulley is rotating counterclockwise. We take those as positive directions. The angular momentum of masses A and B is the same as that of a point mass. We assume the rope is moving without slipping, so $v = \omega_{\text{pulley}}R_0$.

$$L = L_A + L_B + L_{\text{pulley}} = M_A vR_0 + M_B vR_0 + I\omega = M_A vR_0 + M_B vR_0 + I\frac{v}{R_0}$$

$$= \boxed{\left((M_A + M_B)R_0 + \frac{I}{R_0}\right)v}$$

(*b*) The net torque about the axis of the pulley is that provided by gravity, $M_B gR_0$. Use Eq. 11-9, which is applicable since the axis is fixed.

$$\sum\tau = \frac{dL}{dt} \rightarrow M_B gR_0 = \frac{d}{dt}\left((M_A + M_B)R_0 + \frac{I}{R_0}\right)v = \left((M_A + M_B)R_0 + \frac{I}{R_0}\right)a \rightarrow$$

$$a = \frac{M_B gR_0}{\left((M_A + M_B)R_0 + \frac{I}{R_0}\right)} = \boxed{\frac{M_B g}{M_A + M_B + \frac{I}{R_0^2}}}$$