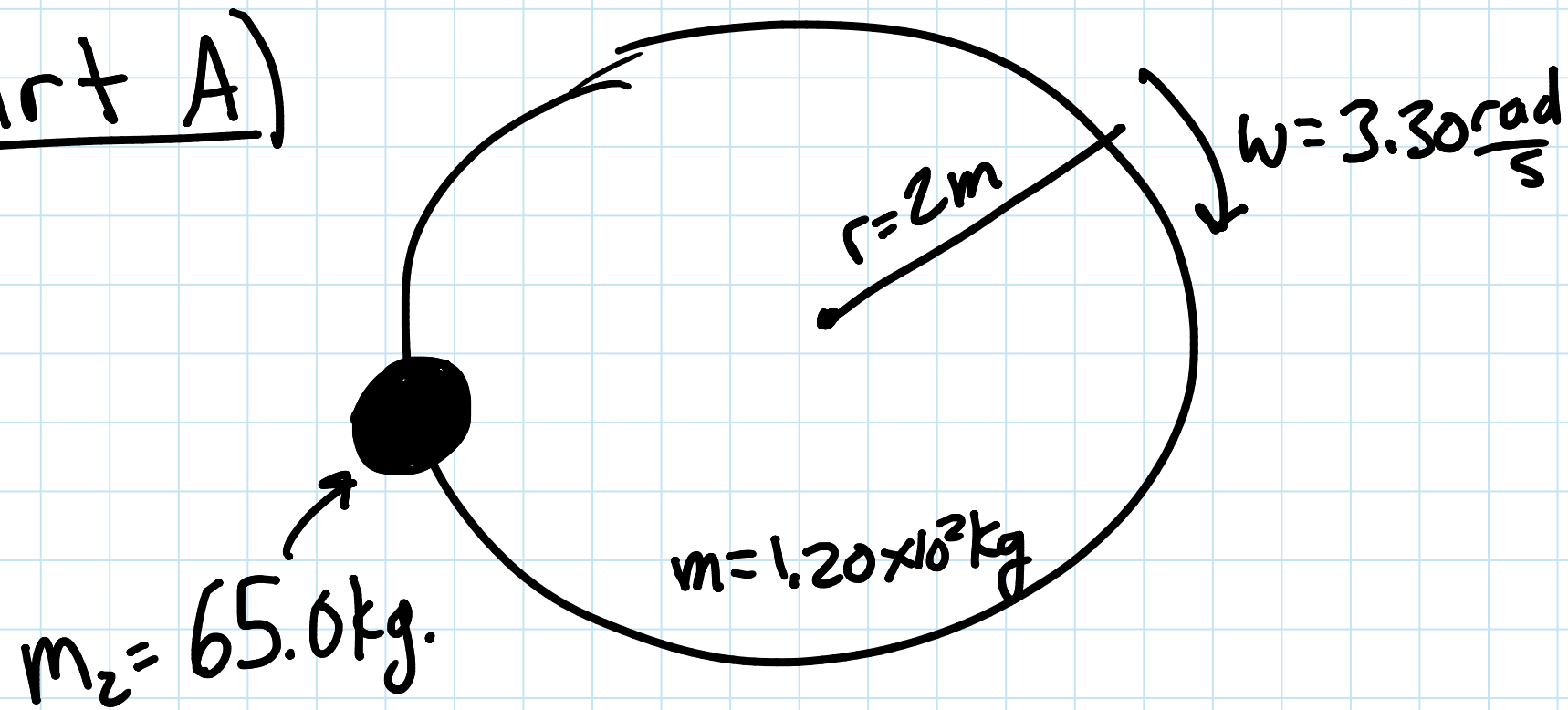


## Exercise 10.47 (Mastering Physics)

Part A)



$$L_i = L_f$$

$$I_i \omega_i = I_f \omega_f$$

$$\frac{1}{2} m r^2 \omega = (I_{\text{disk, com}} + I_{\text{Parachute}}) \omega_f$$
$$= \left( \frac{1}{2} m r^2 + m_2 r^2 \right) \omega_2$$

$$m r^2 \omega = (m r^2 + 2 m_2 r^2) \omega_2$$

$$\omega_2 = \frac{\cancel{m r^2} \omega}{\cancel{m r^2} + 2 \cancel{m_2 r^2}}$$

$$\omega_2 = \frac{m \omega}{m + 2 m_2} = 1.58 \frac{\text{rad}}{\text{s}}$$

Part B)

$$K_1 = \frac{1}{2} I_1 \omega_1^2$$

$$= \frac{1}{2} \left( \frac{1}{2} m r^2 \right) \omega^2$$

$$= \frac{m r^2 \omega^2}{4} \left[ \text{kg} \frac{\text{m}^2 \text{rad}^2}{\text{s}^2} \right] = [\text{J}]$$

$$= 1.31 \times 10^3 \text{ J}$$

Part C)

$$K_2 = \frac{1}{2} I_2 \omega_2^2$$

$$= \frac{1}{2} \left( \frac{1}{2} m r^2 + m_2 r^2 \right) \left( \frac{m \omega}{m + 2 m_2} \right)^2$$

$$= \frac{r^2}{2} \left( \frac{1}{2} m + m_2 \right) \left( \frac{m \omega}{m + 2 m_2} \right)^2$$

$$= 627 \text{ m}^2 \text{ kg} \frac{\cancel{\text{kg}^2 \text{rad}^2}}{\cancel{\text{kg}^2 \text{s}^2}}$$

$$= 627 \frac{\text{kg m}^2}{\text{s}^2}$$

Part D)

$$W = K_2 - K_1$$

$$< 0$$

Work is negative.