

**Physics 10154 - Quiz 9A**

A merry-go-round has a moment of inertia of  $754 \text{ kg}\cdot\text{m}^2$ . It is spinning at a rate of  $0.565 \text{ rev/sec}$ . A  $55\text{-kg}$  child, initially at rest, jumps onto the merry-go-round and lands on the edge,  $1.08$  meters from the center. After the child lands on the merry-go-round, both child and merry-go-round move with the same angular speed.

- a) What is the new angular speed of the system, in rev/sec?  
b) What is the change in kinetic energy of the system?

$$0.565 \frac{\text{rev}}{\text{sec}} \cdot \frac{2\pi \text{rad}}{\text{rev}} = 3.55 \frac{\text{rad}}{\text{s}}$$

$$a) I_1 \omega_{1i} + I_2 \omega_{2i} = (I_1 + I_2) \omega_f$$

$$I_1 = 754$$

$$I_2 = MR^2 = (55)(1.08)^2 = 64.15$$

$$(754)(0.565) + 0 = 818.15 \omega_f$$

$$\boxed{\omega_f = 0.521 \text{ rev/sec}} = 3.272 \text{ rad/s}$$

$$b) K_i = \frac{1}{2} I_1 \omega_{1i}^2 = \frac{1}{2} (754)(3.55)^2 = 4751 \text{ J}$$

$$K_f = \frac{1}{2} (I_1 + I_2) \omega_f^2 = \frac{1}{2} (818.15)(3.272)^2 = 4379 \text{ J}$$

$$\boxed{\Delta K = -372 \text{ J}}$$