

Answer on Question #74189, Physics / Mechanics — Relativity

Question a child of mass 50kg is standing on the edge of merry go round of mass 250kg and radius 3m which is rotating with an angular velocity of 30rad/sec. what will be the final angular velocity of the merry go round when child reached the center ?

Solution We need to use conservation of angular momentum here. Initially we have sum of moments of child and merry-go-around but in the end moment of child becomes 0. Hence:

$$w_1(I_c + I_d) = w_2 I_d$$

Here we have: $w_1 = 30$ rad/s - initial angular velocity, $I_c = m_c r_d^2$ is moment of inertia of a child and $I_d = m_d r_d^2 / 2$ is moment of inertia of merry-go-around, which we assumed is a disk, $m_c = 50$ kg, $m_d = 250$ kg, $r_d = 3$ m. So we find final angular velocity:

$$w_2 = w_1 \frac{m_d r_d^2 / 2}{m_c r_d^2 + m_d r_d^2 / 2} = 30 \frac{1125}{450 + 1125} \approx 21.4 \text{ rad/s}$$