

THE PHYSICS PUZZLER



An ice skater is spinning with her arms extended and has an initial angular velocity of 1.5 rad/s . Her initial moment of inertia with her arms extended is $4.0 \text{ kg} \cdot \text{m}^2$. She then pulls her arms in, reducing her moment of inertia to $1.5 \text{ kg} \cdot \text{m}^2$.

What is her new angular velocity after pulling in her arms?

SOLUTIONS



New Angular Velocity Calculation

Angular momentum L is conserved, so:

$$L_{\text{initial}} = L_{\text{final}}$$

Considering...

$$L = I \times \omega$$

And solving for the angular velocity:

$$I_{\text{initial}} \times \omega_{\text{initial}} = I_{\text{final}} \times \omega_{\text{final}}$$

$$\omega_{\text{final}} = \frac{4.0\text{kg}\cdot\text{m}^2 \times 1.5\text{rad/s}}{1.5\text{kg}\cdot\text{m}^2} = 4.0\text{rad/s}$$

Therefore, the new angular velocity is 4.0rad/s