EXAMPLE: HOLDING WEIGHTS ON A SPINNING STOOL

EXAMPLE**:** You stand on a stool that is free to rotate about an axis perpendicular to itself and through its center. Suppose that your combined moment of inertia (you + stool) around this axis is 8 kg m², and that it is the same whether you have your arms stretched open, or pressed against your body (not true, but simpler). You stand on the stool with arms wide open, holding one 10 kg small weight on each hand, at a distance of 80 cm from the central axis**.**

(a) Calculate the system's total (you + stool + 2 weights) moment of inertia about its central axis**.**

(b) Suppose the system spins with 60 RPM. Calculate its angular moment about its central axis**.**

(c) You bring the weights to your chest, so they lie on the axis of rotation. Calculate the system's new moment of inertia**.**

(d) You bring the weights to your chest, so they lie on the axis of rotation. How fast, in RPM, will the system rotate now**?**

PRACTICE: CLOSING YOUR ARMS ON A SPINNING STOOL

PRACTICE**:** You stand on a stool that is free to rotate about an axis perpendicular to itself and through its center. The stool's moment of inertia around its central axis is 1.50 kg m**²**. Suppose you can model your body as a vertical solid cylinder (height = 1.80 m, radius = 20 cm, mass = 80 kg) with two horizontal thin rods as your arms (each**:** length = 80 cm, mass = 3 kg) that rotate at their ends, about the same axis, as shown. Suppose that your arms' contribution to the total moment of inertia is negligible if you have them pressed against your body, but significant if you have them wide open.

→ If you initially spin at 5 rad/s with your arms against your body, how fast will you spin once you stretch them wide open**?**
(*Note**:** The system has 4 objects (stool + body + 2 arms), but initially only stool + body contribute to its moment of inertia****)***