Science Virtual Learning

MPI Physics 210

Rotational Dynamics 9 – Newton's 2nd Law for Rotation

April 29, 2020

Lesson: MPI Newton's 2^{nd} Law for Rotation
April 29, 2020

Objective: To use torque and moment of inertia to predict the angular acceleration of a rotating object

This video discusses Newton's 2nd Law for rotation, and how torques cause rotational motion. It also includes an example

https://youtu.be/tiPuJA_jCkg

Video: Newton's 2nd Law for Rotation

The woman in the picture is pushing a 36.0 kg door 0.700 m from its hinges. She exerts a 65.0 N force perpendicular to the door.

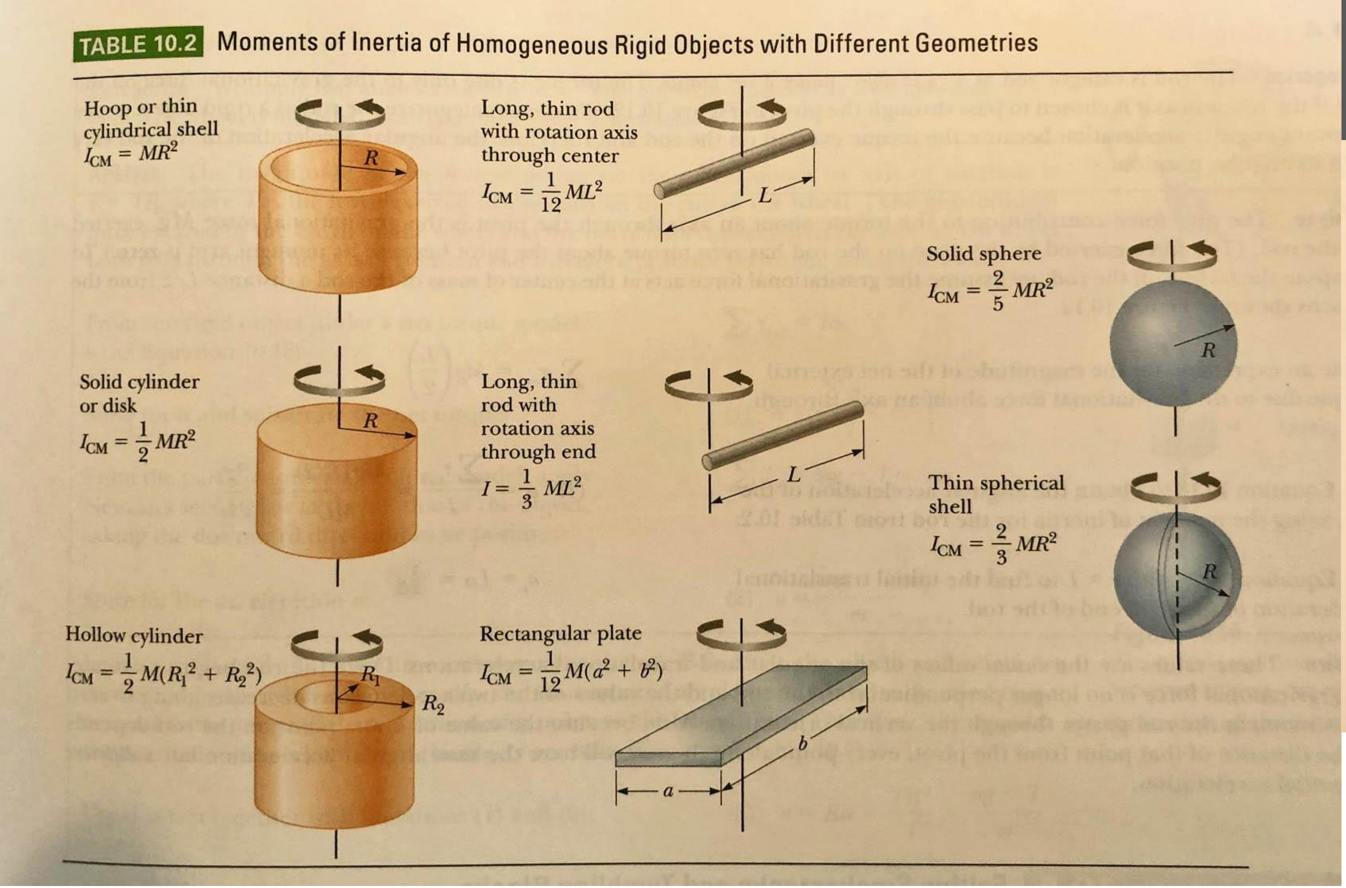
a) How much torque does she exert?

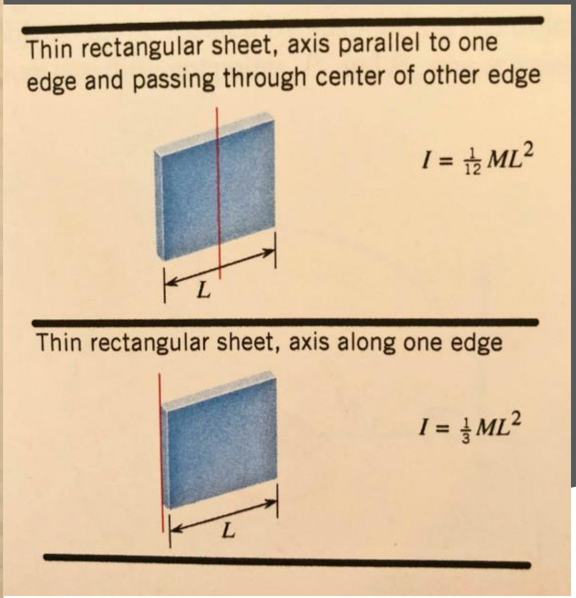
b) What is the moment of inertia of the door?

c) What is the resulting angular acceleration?

d) If she pushes the door for 1/8 of a rotation, what is its angular velocity at the end?

Newton's 2nd Law Example





Moments of Inertia for Different Shapes

Equation	Missing
1. $\omega_f = \omega_i + \alpha t$	$\Delta\theta$
2. $\Delta\theta = \frac{1}{2}(\omega_f + \omega_i)t$	α
3. $\Delta\theta = \omega_i t + \frac{1}{2}\alpha t^2$	ω_f
4. $\omega_f^{\,2} = \omega_i^{\,2} + 2\alpha\Delta\theta$	t
5. $\Delta\theta = \omega_f t - \frac{1}{2}\alpha t^2$	ω_i

Rotational Motion Equations

Homework

A basketball is a hollow sphere of radius 0.121 m and mass 0.624 kg. A player starts the ball spinning on her finger by exerting a 5.00 N force tangent to the basketball, for ¼ of a turn. Find the angular acceleration, and final angular velocity.

- Try to solve the problem yourself, then watch the first part of the solution video:
- https://youtu.be/ijYnXbZx7zA

That’s it!