# Science Virtual Learning

# MPI Physics 210

## Rotational Dynamics 11
## Rotational Kinetic Energy

May 1, 2020

Lesson: MPI Rotational Kinetic Energy
May 1, 2020

**Objective: To understand the concept of Rotational Kinetic Energy, and how to calculate it**

This video introduces rotational kinetic energy, and how it is calculated.

https://youtu.be/hbDLWZhJNMs

# Video:  Rotational KE

# Rotational KE Examples

1. A 0.0500-kg pizza cutter wheel of radius 0.0530 m is spinning at 3.00 rotations per second. How much rotational KE does it have?

2. The propellers on a World War II fighter plane had 4 blades, each 1.70 m long and with a mass of 105 kg. When the engine starts, it speeds up the propeller from rest to 1260 rpm in 12.0 seconds.

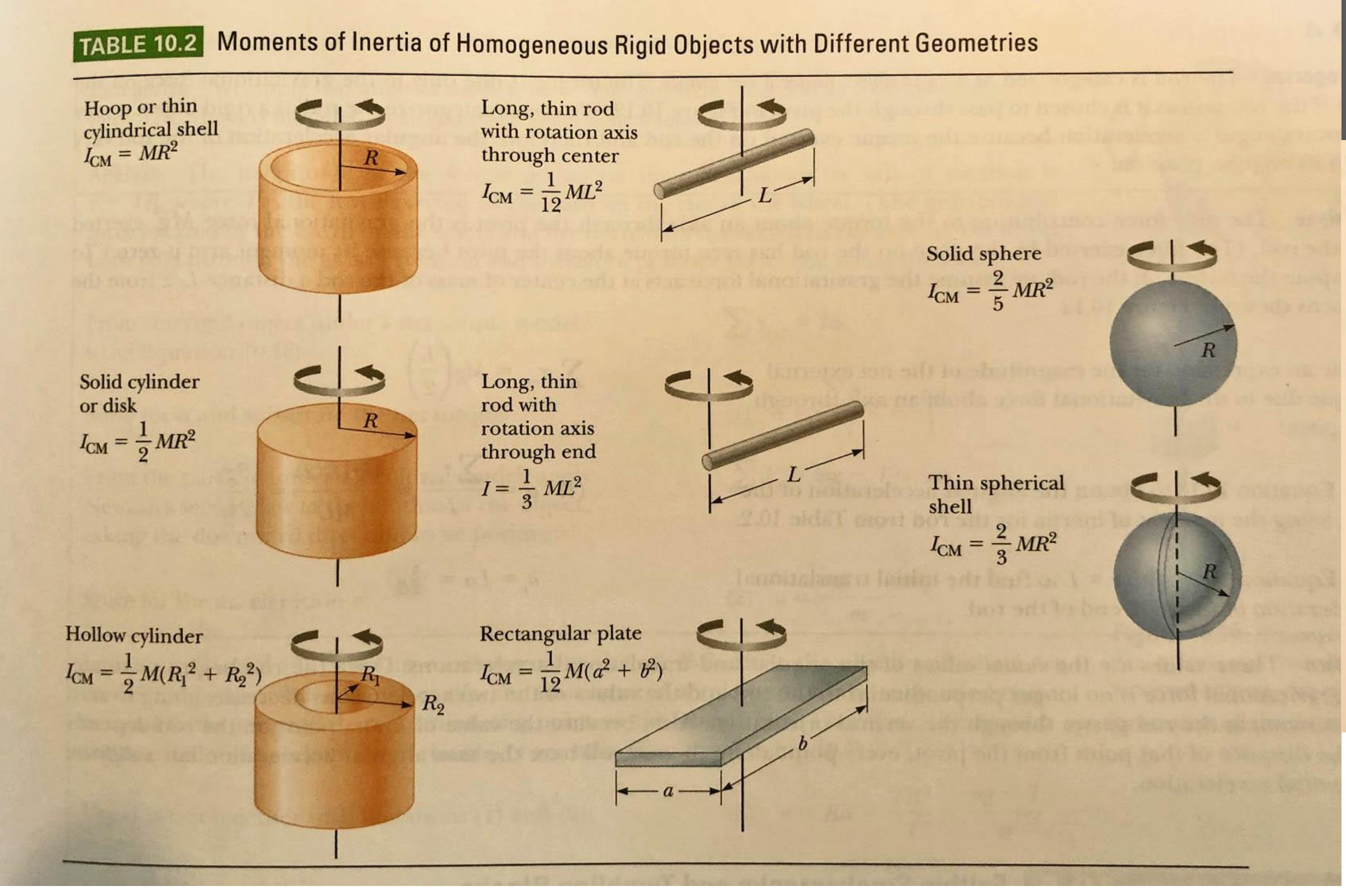
a) What is the moment of inertia of the propellers?

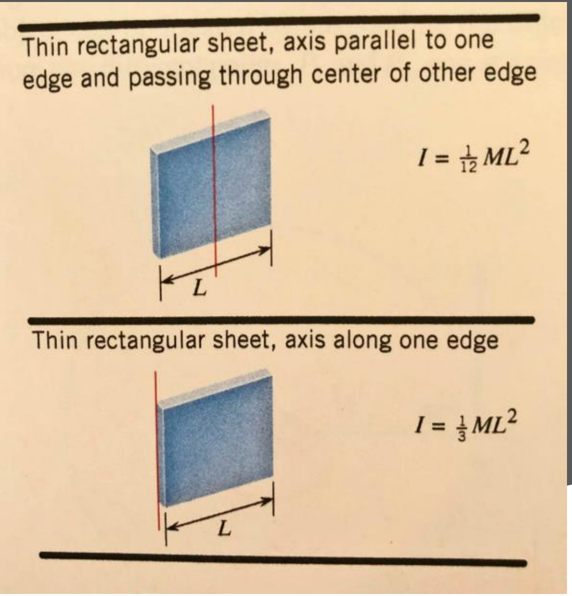
b) How much rotational KE do the propellers have at the end?

c) How much Work did the engine do on the propellers?

d) How much power P does the engine produce?

Video: [https://youtu.be/HIrt6r5lm8U](https://youtu.be/HIrt6r5lm8U)



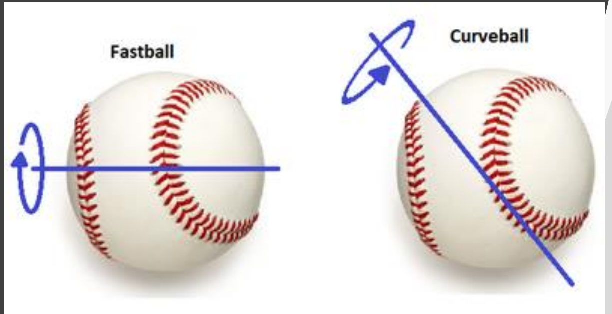




# Moments of Inertia for Different Shapes

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

# Rotational Motion Equations

# Homework 1



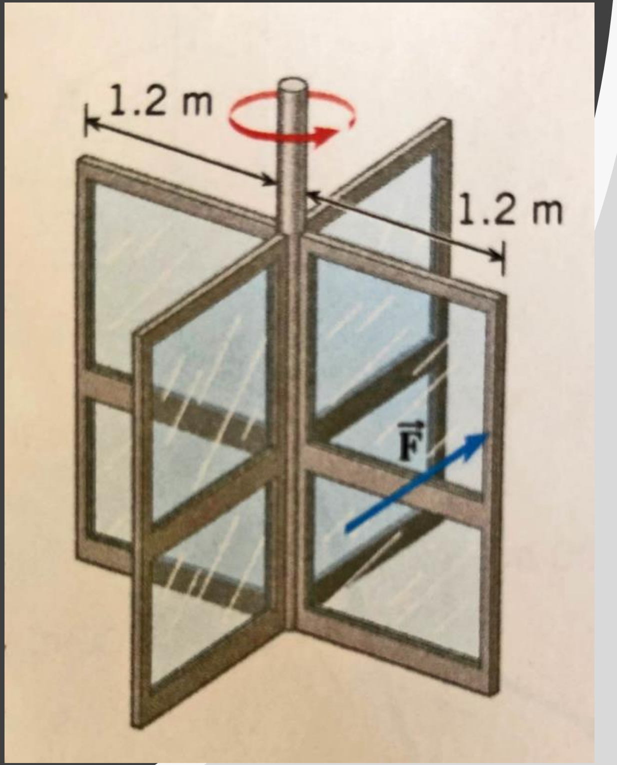

A baseball is a solid sphere of mass 0.150 kg and radius 0.0375 m. To throw a curveball, pitchers spin the ball at 2500 rpm.

a) What is its rotational KE?

b) If it is also moving at 35.0 m/s toward the batter, what is its linear KE?

- Try to solve the problem yourself, then watch the first part of the solution video:
- https://youtu.be/1jzWn16ckgM

# Homework 2




A revolving door at a hospital consists of four doors, each 1.20 m wide and of mass 85.0 kg, rotating about a central axis; see picture. A person does 9.73 J of work pushing the door. If all of that Work goes into rotational KE, what is the final angular speed of the door?

- Try to solve the problem yourself, then watch the first part of the solution video:
- [https://youtu.be/3VsjLdglCio](https://youtu.be/3VsjLdglCio)

# That's it!