No clickers and YES CALCULATORS!!

Have out pg. 205

Get the Moment of Inertia notes from the brown table.

Mar 21-8:51 AM

8.2 The moment of Inertia

**Compare swinging motion of dumbells

a) Center and held close to the body
b) End and far from the the body.

Harder to stop & change direction when weight is farther away.

Mar 21-9:03 AM

8.2 The moment of Inertia

a) Resistance to rotation

b) Symbol is I

c) EQUATION: $I = m r^2$

d) Units: $I = Kg \cdot m^2$

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The Moment of Inertia depends on the shape of an object - TABLE 8-2 on page 206

1) Where is mass located at an object.

2) Bicycle wheel weight is an outside edge: $I = mr^2$

3) Solid cylinder is: $I = \frac{1}{2}mr^2$ Weight spread out throughout the circle

Moments of Inertia for Various Objects

Object	Location of Axis	Diagram	Moment of Inertia
Thin hoop of radius r	Through central diameter		mr^2
Solid, uniform cylinder of radius r	Through center		$\frac{1}{2}mr^2$
Uniform sphere of radius r	Through center		$\frac{2}{5}mr^2$
Long, uniform rod of length l	Through center		$\frac{1}{12}ml^2$
Long, uniform rod of length l	Through end		$\frac{1}{3}ml^2$
Thin, rectangular plate of length l and width w	Through center		$\frac{1}{12}m(l^2 + w^2)$

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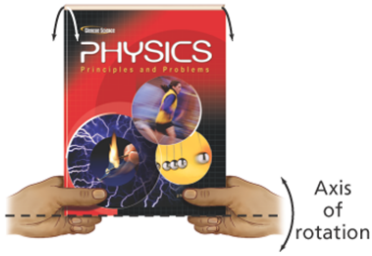
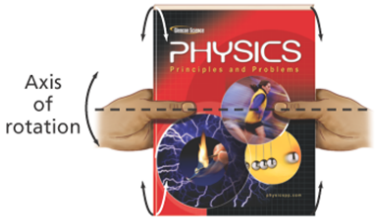
4) To observe how the moment of inertia depends on the location of the rotational axis, hold a book in the upright position and put your hands at the bottom of the book. Feel the torque needed to rock the book toward and away from you.





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Example:
The baton twirler Cindy is practicing twirling. The length of the baton is 0.80m and the mass of the rubber ball on each end is 0.50 kg. Find the moment of inertia of the baton as Cindy rotates it by the midpoint. Calculate the moment of inertia if she holds it by one end.

$\ell = 0.80m$ .80m
$m = 0.50kg$ .50kg .50kg

a) $r = \frac{1}{2}\ell$ Rotates on midpoint
$\frac{1}{2}(0.8)$ $r = .4m$

b) Single mass on one end.

$I = mr^2$
$(.5)(.4)^2 = .08 Kgm^2$

$I = 2$ single mass Inertia $.08 Kgm^2$
baton
$2(.08) = 0.16 Kgm^2$

$I = mr^2$
$(.5)(.8)^2 = 0.32 Kgm^2$

Double the distance
Inertia is X 4

Mar 21-9:20 AM