Physics 101: Lecture 16
Rolling Objects and Angular Momentum

HW 7&8 due this Thurs.!

Review session for Exam 2
Monday 3/26 7:00 PM+
in Loomis 144

Linear and Angular relations

	Linear	Angular
Displacement	x	θ
Velocity	v	ω
Acceleration	a	α
Inertia	m	I
KE	$\frac{1}{2} m v^2$	$\frac{1}{2} I \omega^2$
N2L	F=ma	$\tau = I\alpha$
Momentum	p = mv	$L = I\omega$

$x = R\theta$

$v = \omega R$

$a_t = \alpha R$

Today (→ Momentum)

Define Angular Momentum

Momentum

$p = mV$

$F_{net,external} = \Delta p/\Delta t$

conserved if $F_{ext}\Delta t = 0$

Vector!

units: kg-m/s

Angular Momentum

$L = I\omega$

$\tau_{Net,external} = \Delta L/\Delta t$

conserved if $\tau_{Net,ext}\Delta t = 0$

Vector!

units: $kg\text{-}m^2/s$

Right Hand Rule

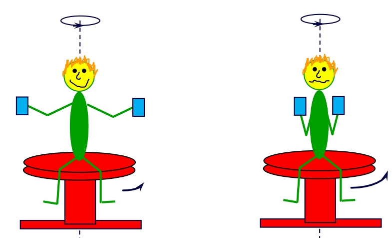
- Since angular momentum is a vector we need a way to decide on its direction. We use the "right hand rule" for that.
- Wrap fingers of **right hand** around direction of rotation, thumb gives direction of angular momentum.
- What is direction of angular momentum for wheel

A) Up B) Down C) Left D) Right

Clicker Qs

You are sitting on a freely rotating bar-stool with your arms stretched out and a heavy glass mug in each hand. Your friend gives you a twist and you start rotating around a vertical axis though the center of the stool. You can assume the bearing that the stool turns on is frictionless, and that there is no net external torque present once you have started spinning.

You now pull your arms and hands (and mugs) close to your body.



Summary

- Angular momentum defined: $L = I\,\omega$
  - Right Hand Rule gives direction
  - If $\tau_{Net,external} = 0$, L is conserved