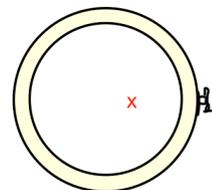
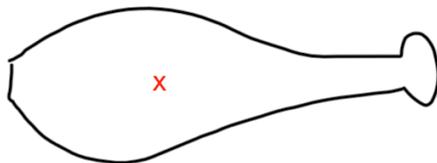
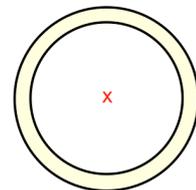


CENTER OF MASS (CM)

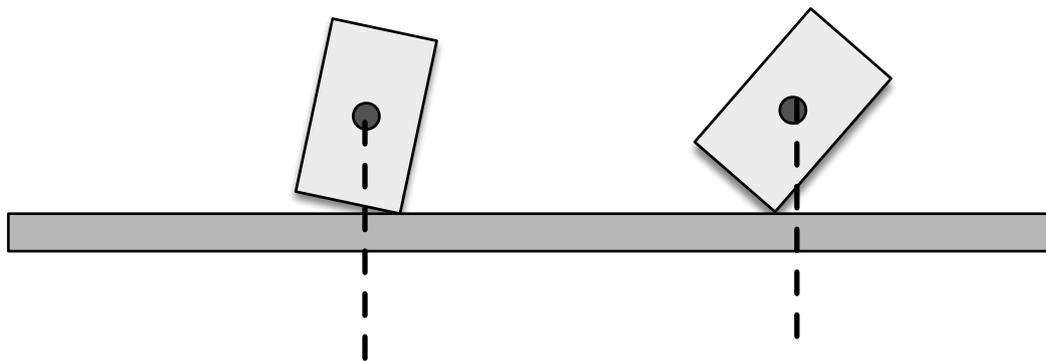
The average position of all the pieces of mass in an object

1. Objects balance at their CM.
2. When freely spun, objects rotate around their CM.
3. When hung from any point, an object's CM will be below the point it's hung from.
4. An object will topple if its CM is not over its base.
5. It's the CM that obeys all the Laws of Physics we've been learning about this year.



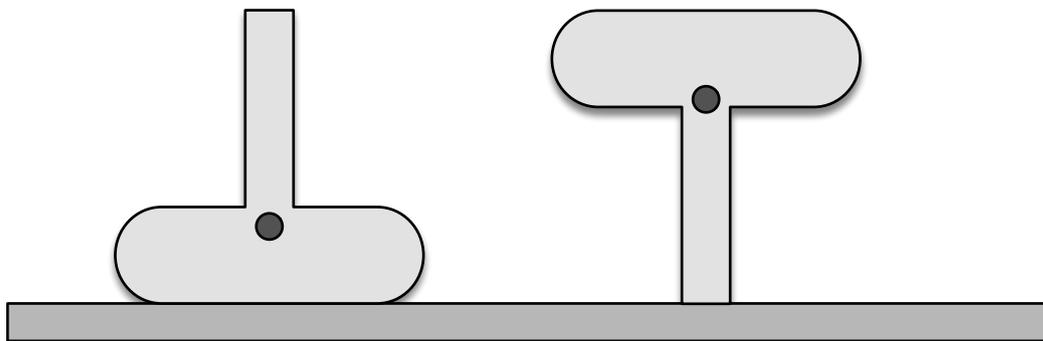
OBJECTS TOPPLE OVER WHEN THEIR CM IS NOT OVER THEIR BASE.

Draw a line straight down from the CM.
If it does not go through the base,
the object will topple.



Won't topple

Will topple



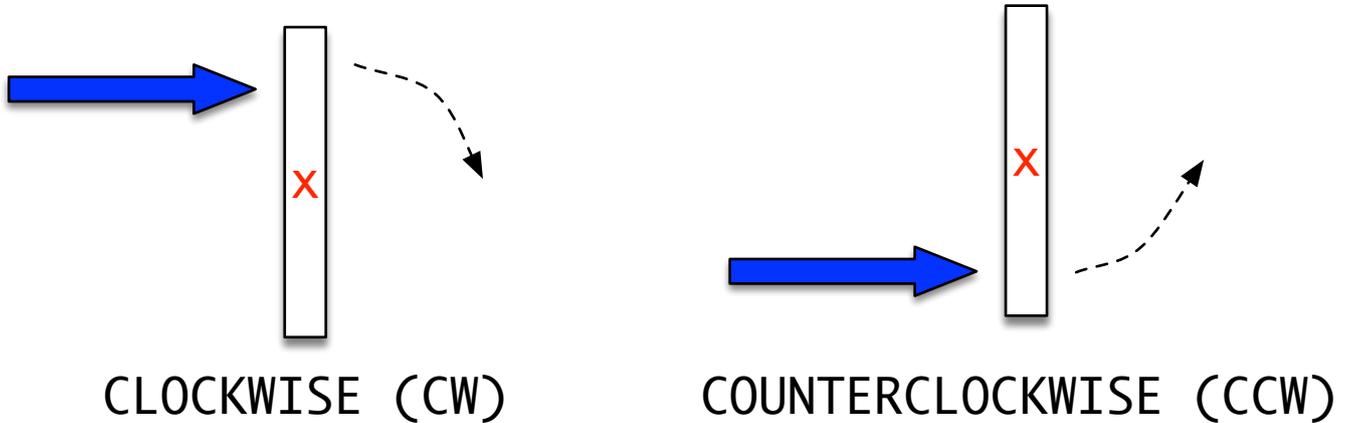
**Objects with a
LOW CM and a
WIDE base are
stable.**

**Objects with a
HIGH CM and a
NARROW base
are unstable.**

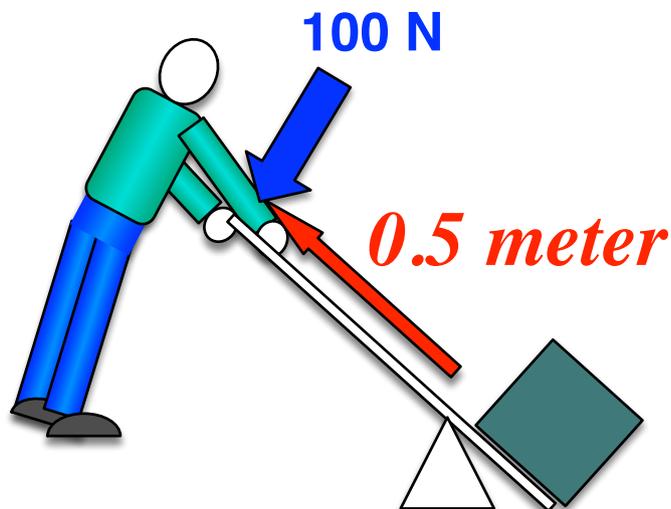
Torque Notes

Forces not at the pivot
Cause objects to rotate.

(Objects tend to pivot around their CM)



Torque = (force)(dist.from pivot)

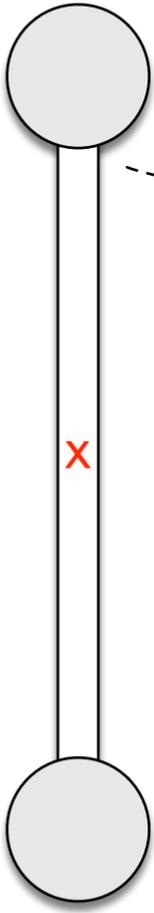


$$\text{Torque} = (100 \text{ N})(0.5 \text{ m}) = 50 \text{ Nm}$$

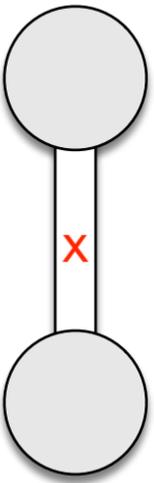
Rotational Inertia Notes

Mass CLOSE to pivot = EASIER to start/stop spinning

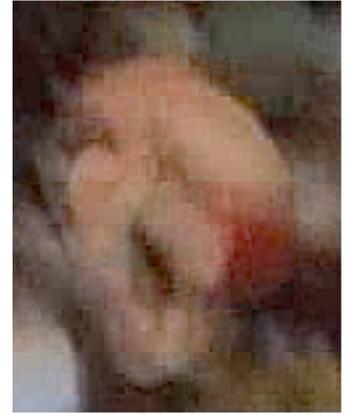
Mass FAR from pivot = TOUGHER to start/stop spinning



Tougher to get going;
tougher to stop.



Easier to get going;
easier to stop.



Newton's 1st Law for Rotation

Objects maintain spin and DIRECTION OF AXIS,
unless there's an outside Torque.

