Two meter sticks are stood in the corner where the floor meets the wall. One has a large mass attached to the end furthest from the corner. Which one hits the ground first?

We'll solve the problem by calculating the *Angular Acceleratio*n of each object and then comparing them.

a) Calculate the angular acceleration of the meter stick falling over under the influence of gravity.

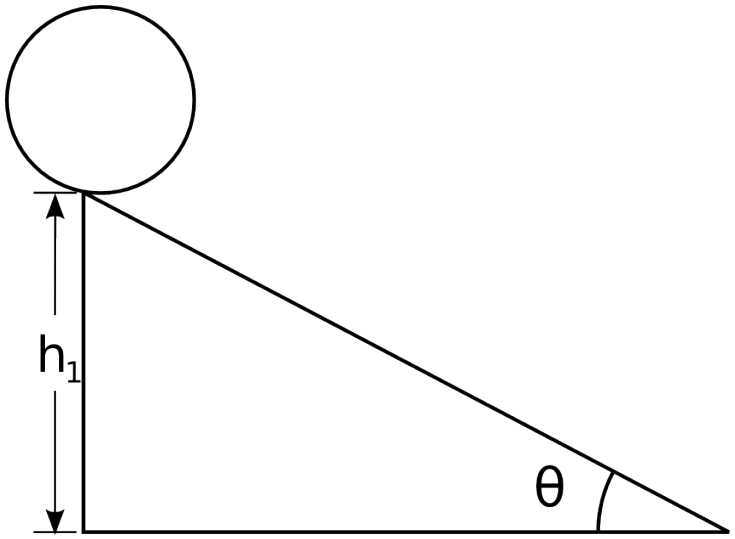
b) Calculate the angular acceleration of a meter stick with a large mass attached to its end falling over under the influence of gravity.

c) Take the ratio $\frac{\alpha_a}{\alpha_b}$. Is it greater than or less than one? Which stick hits the ground first?

Use **Torque and Kinematics** to solve this problem.

A rolling object with a radius *R*, mass *m*, and moment of inertia *I*, starts from rest at the top of an incline plane of height *h* that makes an angle θ with the horizontal.

a) Find an expression for the linear and angular acceleration, α, of the object in terms of *I, m, R, g,* and θ.
b) Using kinematics, find an expression for the linear and angular velocity of the object at the bottom of the ramp in terms of *I*.
c) Assume that the object is a disk with $I=\frac{1}{2}mR^2$ and plug I into your velocity expressions. Verify that your answers are the same as when you solved this problem using energy.

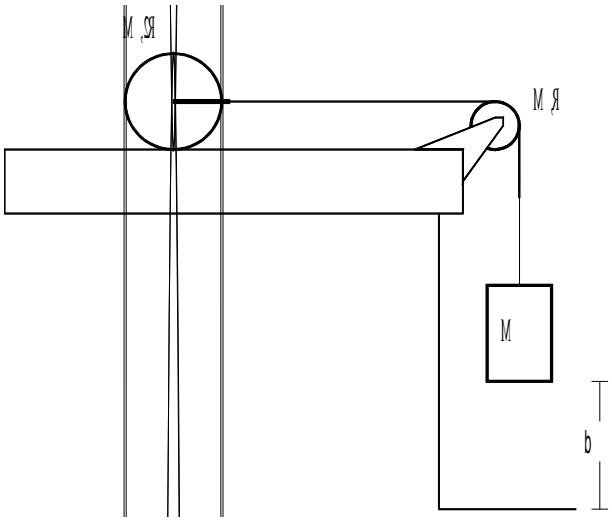


Use **Torque and Newton's Second Law** solve this problem.

A solid cylinder (radius = 2R, mass = M) rolls without slipping as it is pulled by a massless yoke attached to a string. The string goes over a frictionless pulley shaped as a solid disk (radius = R, mass = M) and is attached to a hanging weight (mass = M).

$$I_{cylinder} = \frac{1}{2} MR^2$$

What is the acceleration of the system?



Use **Torque and Newton's Second Law** solve this problem.

A block of mass M rests on a rough table with $\mu_k = 0.3$. A massless string is attached to the block, wrapped around a solid cylinder having a mass M and a radius R, runs over a massless frictionless pulley, and is attached to a second block of mass M that is hanging freely.

Find the acceleration of this system.

$$I_{cylinder} = \frac{1}{2} MR^2$$