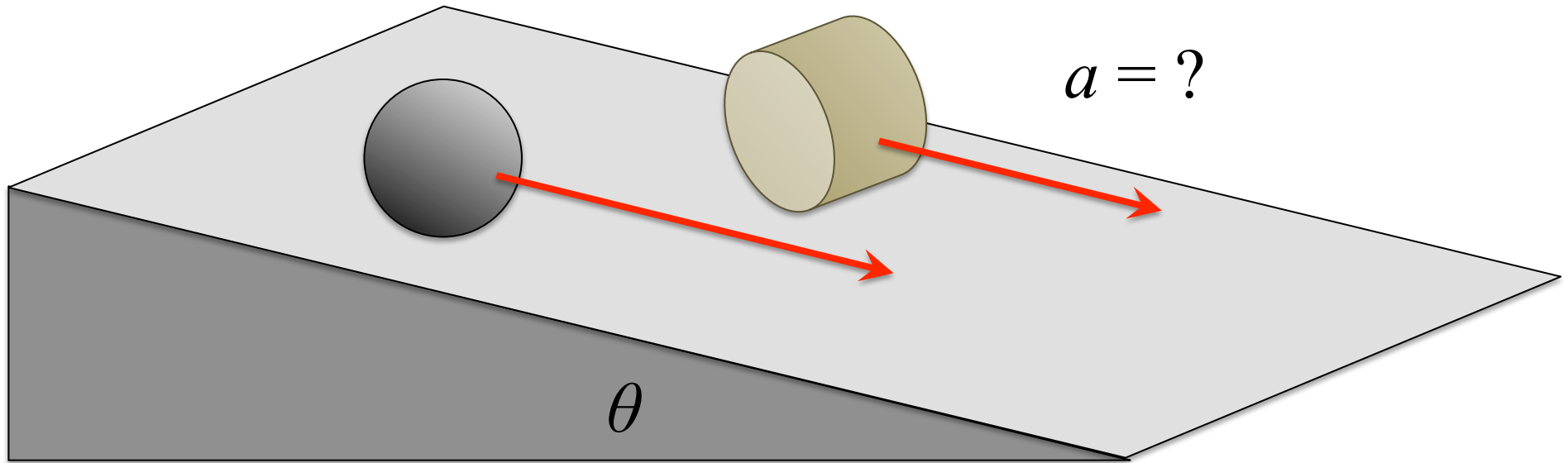


Mini-Lab: Ramp Race, Rolling



Solve for each acceleration in terms of θ and appropriate constants: a ring (or pipe), a solid cylinder, and a solid sphere.

Mini-Lab: Ramp Race, Rolling

1. Goal: verify the expected effect of an object's rotational inertia on its acceleration while rolling down a ramp.
2. Derive an expression for the linear acceleration of each object rolling down a ramp of incline θ . Rotational inertia: ring (or pipe) $I = MR^2$, solid cylinder $I = \frac{1}{2} MR^2$, solid sphere $I = \frac{2}{5} MR^2$.
3. Create a ramp by supporting one end of a board on a book or other object.
4. Arrange a race of objects rolling equal distance and confirm which one has a greater acceleration judging by the time.
5. Arrange a "race" of objects rolling *equal time, different distances* – use kinematics to determine a ratio of distances that the objects would travel in an equal amount of time. Start the two objects at unequal distances of this ratio so that they should cross the finish line at the same time. Observe any discrepancies and assess the results.