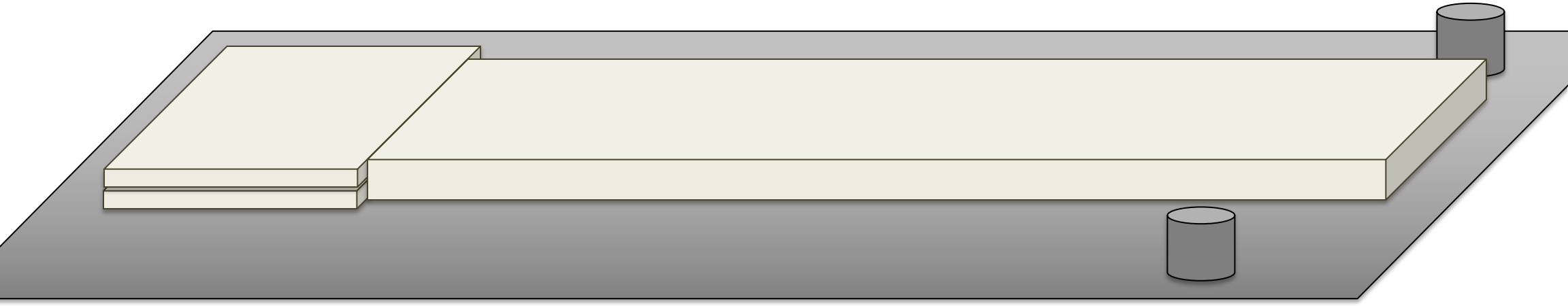
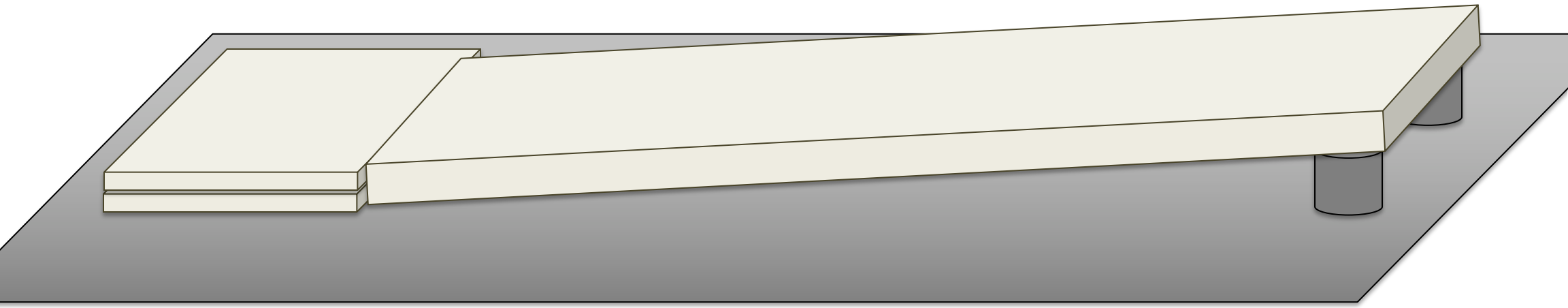
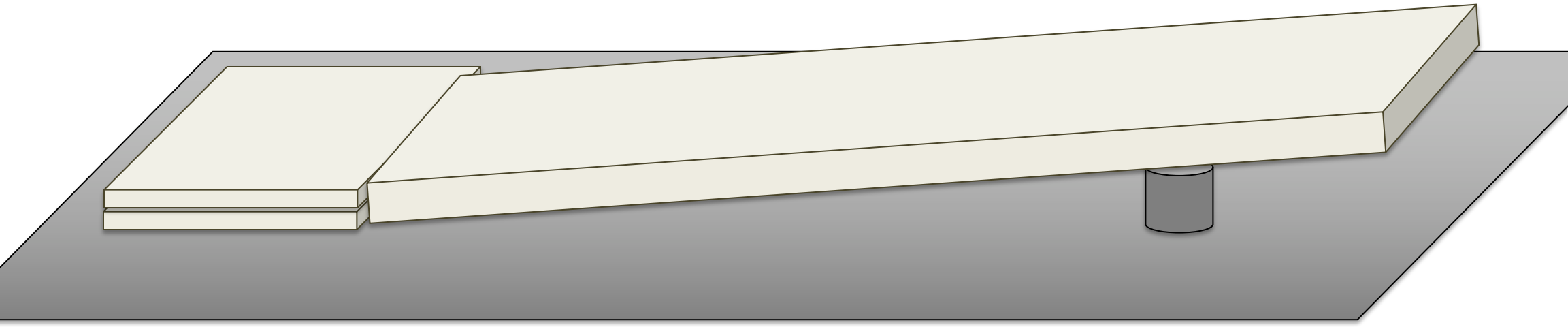
Mini-Lab: Ramp Rollers



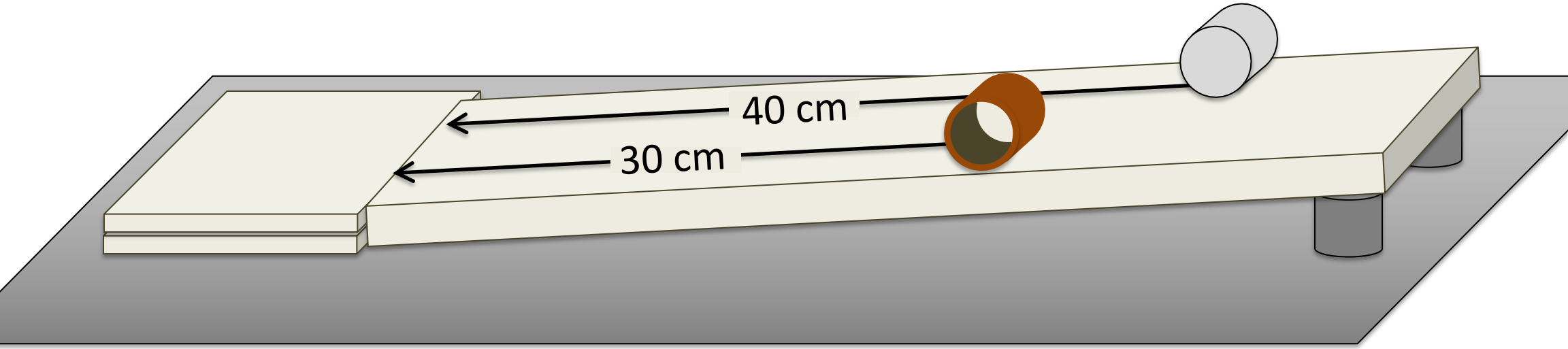
Mini-Lab: Ramp Rollers



Mini-Lab: Ramp Rollers

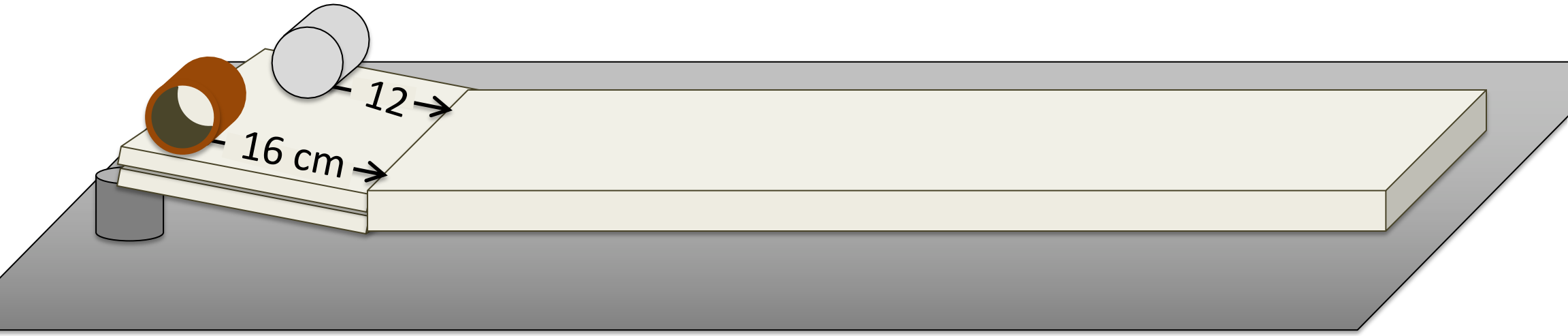


Place the pipe and cylinder at distances 30 cm and 40 cm from the end of the ramp. Release the pipe and the cylinder at the exact same time. Repeat the experiment several times and observe closely. What aspect of this motion do the two objects have in common (ideally)?



Why should the distance ratio 3/4 cause this result?

Place the pipe and cylinder at distances 16 cm and 12 cm from the end of the ramp. Release the pipe first and then the cylinder, so that they reach the bottom together. Repeat the experiment several times and observe closely. What aspect of this motion do the two objects have in common (ideally)?



Why should the distance ratio 4/3 cause this result?

For an object with rotational inertia $I = nMR^2$:

1. Derive an expression for the speed v at the end of the ramp.
2. Derive an expression for the acceleration a while rolling down the ramp.
   Put each result in terms of n, h, d, and appropriate constants!
3. How do these expressions explain the observations?
4. Design an experiment that could be used to further test these expressions using either a stopwatch or a solid sphere.