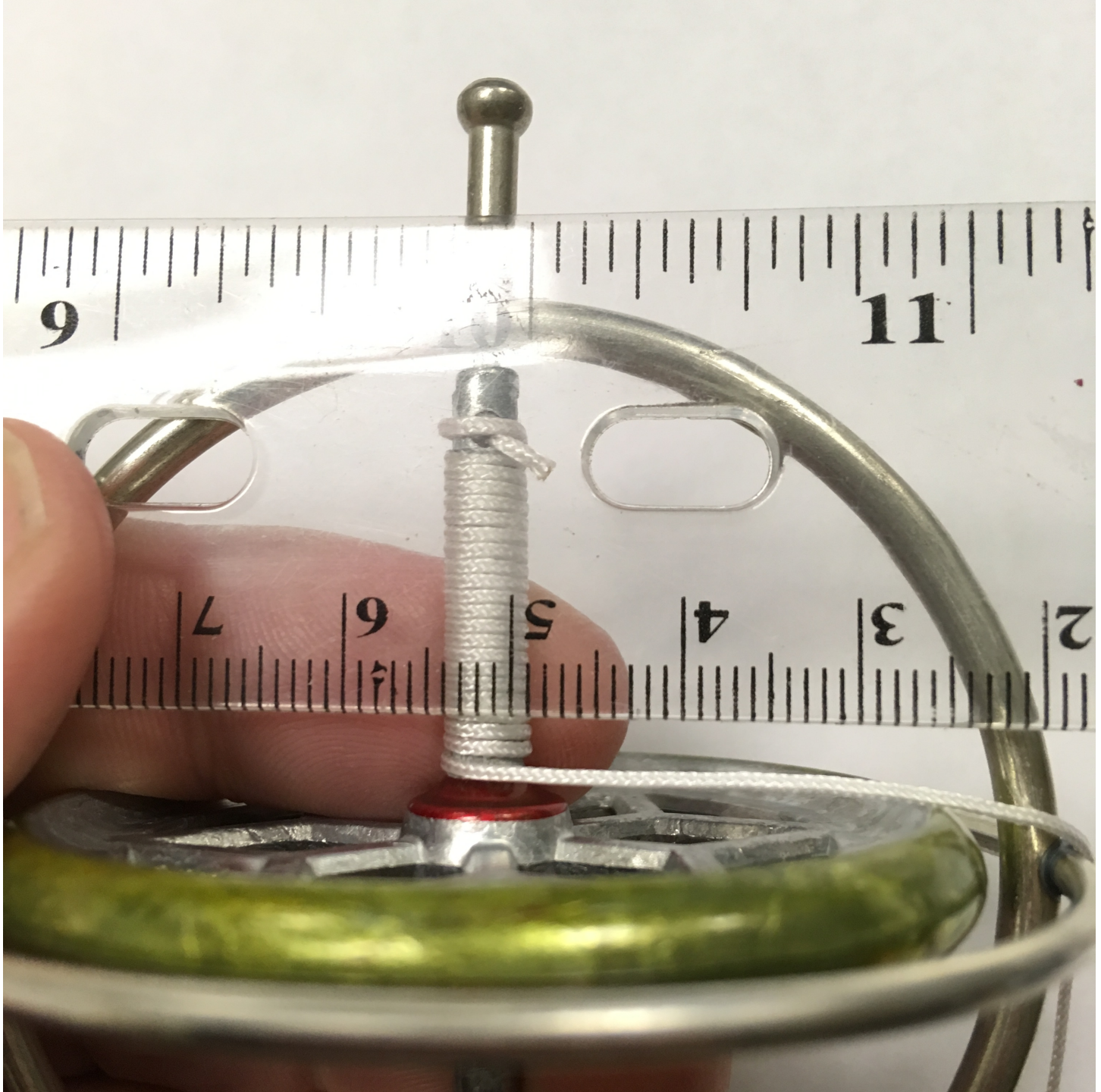
Mini-Lab: Spinning a Gyroscope

1. Use masking tape and/or a temporary mark to make it possible to judge the number of times your object spins.
2. Hold the axis vertical. Use your fingers to spin the gyroscope. Apply force for <u>one half a revolution</u> – try this two ways: finger(s) on the axle and finger(s) on the edge of the wheel.
3. Using a stopwatch and/or cell phone video, determine the time for the object to slow to a stop and the number of revolutions (including fractions) that it turns as it stops. Repeat for several trials of varying length of spinning.
4. Use your data and kinematics to determine the angular acceleration (*i.e.* angular deceleration caused by friction) for each trial. These values should be the same – why?

5. How could a linear graph be made with this data? Angular acceleration would relate to the slope how? Use this method on your graphing calculator, or simply take an average of each trial to find a best value for angular deceleration due to friction.
6. Last trial (the fun one!): Wrap one layer of string on the axle (about 20 turns at most). Use the string to spin the gyroscope. Measure the time it takes to pull the string off AND the time after that that the gyroscope spins before coming to a complete stop.
7. (a) Use the distance the string was pulled and the time to determine the maximum angular speed. (b) Use the coast-down time and the friction results to determine the maximum angular speed. (c) Similar results? Discuss.



Rotor Info:

axle radius: 0.23 cm

wheel radius: 2.85 cm