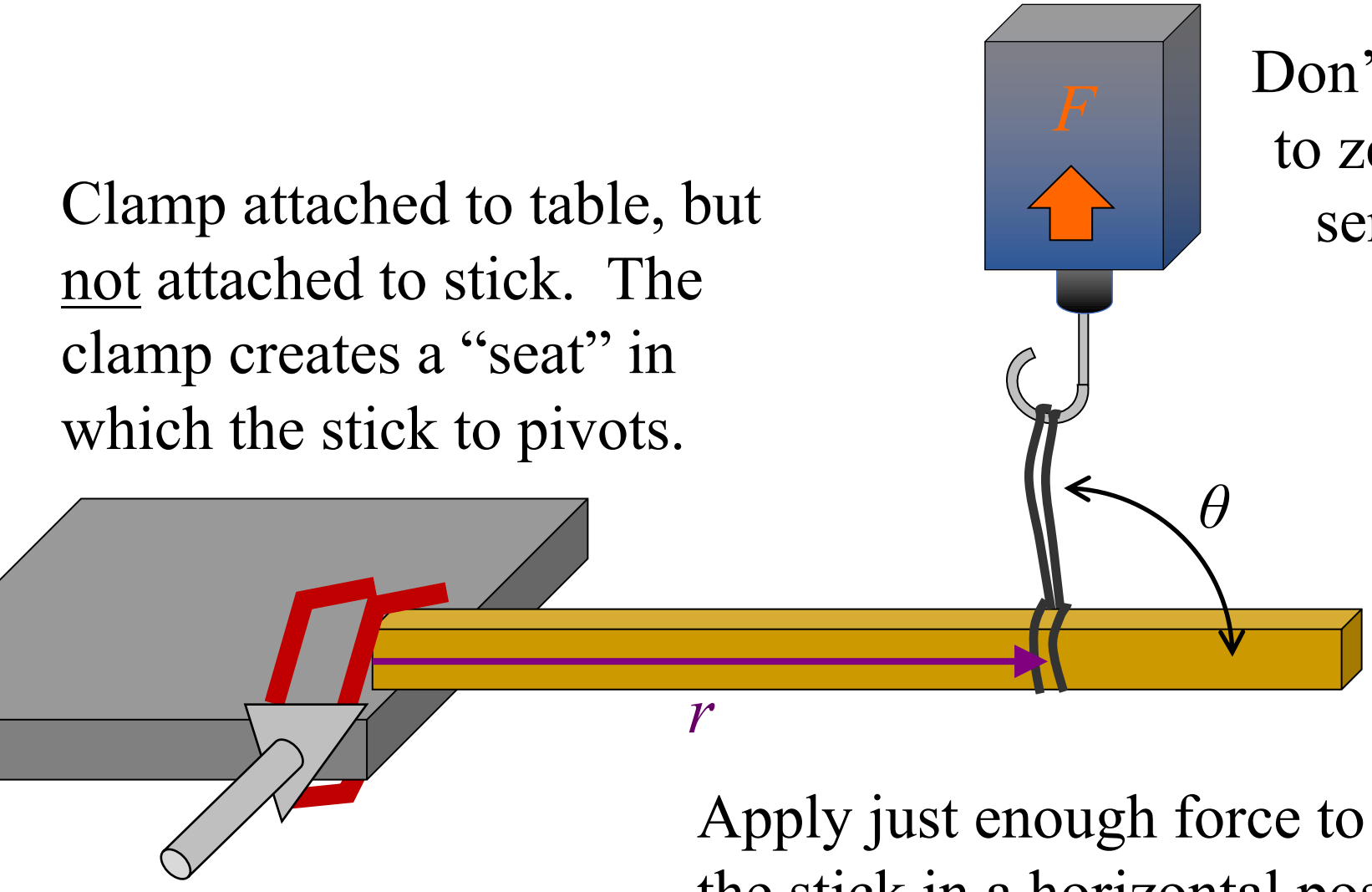
Mini-Lab Torque

GoDirect & Pivoting Meter Stick

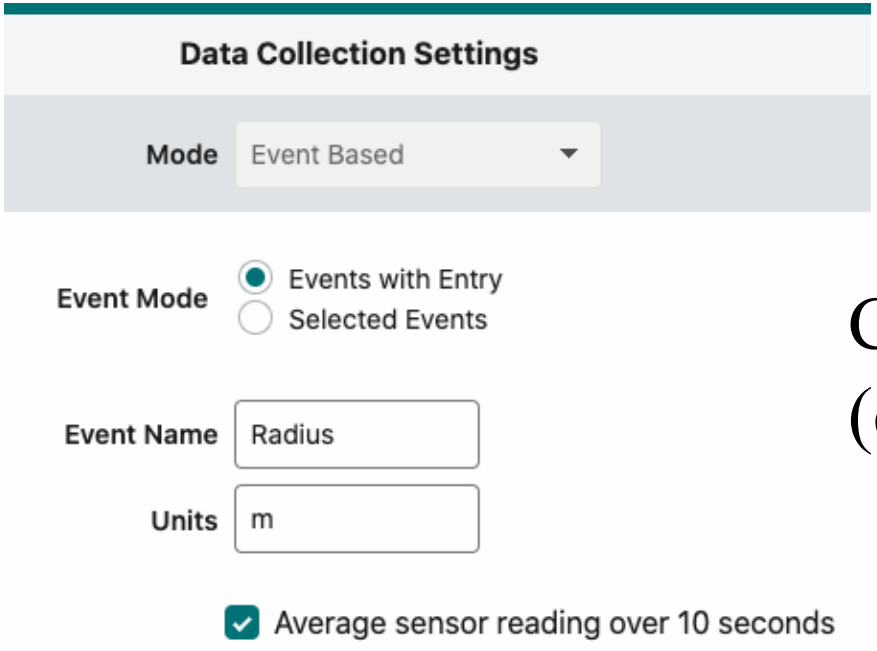
torque of applied
force causes
CCW rotation
τ_A
τ_g
torque of gravity
causes CW rotation

Clamp attached to table, but not attached to stick. The clamp creates a "seat" in which the stick to pivots.

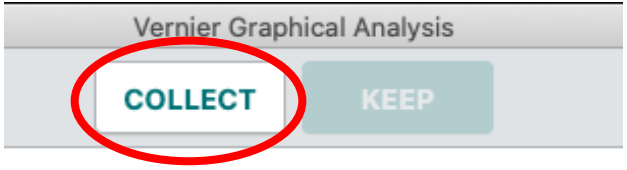


Don't forget to zero the sensor!

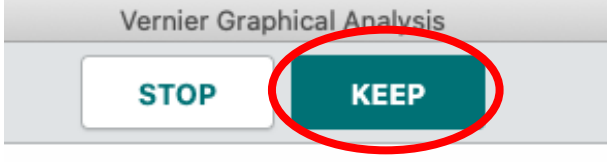
Apply just enough force to hold the stick in a horizontal position.



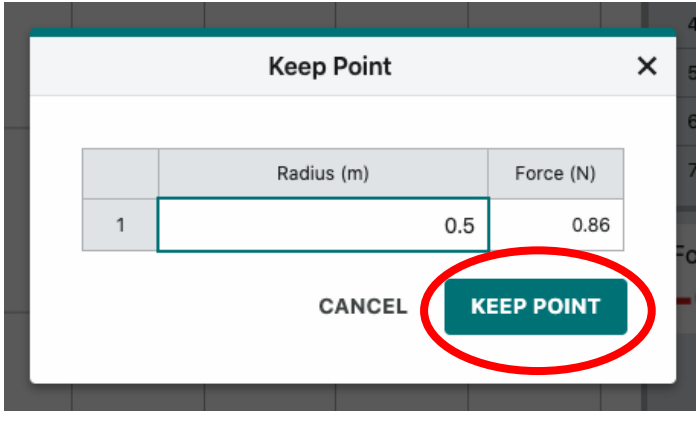
Click Collect to start a Data Set



Click Keep to record a data point, (clicking Stop ends the Data Set)



Type the radius into the entry box and click Keep Point. Repeat the process to add data points to the current Data Set.



1. Use a loop of string and GoDirect Force sensor to lift meter stick, pivoting about one end. Use just enough force to prevent gravity from causing the stick to rotate downward. Note the point of application, r, and the direction, θ.
2. Data Collection parameters: Event Based, Events with Entry, Name = Radius, Units = m, use 10 second average.
3. Data Set 1: "Keep" Force readings at various radii: r = 80, 70, 60, 50, 40, 30, 20 cm, while keeping $\theta = 90^{\circ}$
   Data Set 2: Repeat the process with $\theta = 135^{\circ}$.
4. Data Set 3: Find the balancing point with the stick simply hanging from the sensor – note the value of r (should be close to 50 cm). Measure and record the weight (F_g) of the stick. Calculate a torque using these values of r and F.

Analysis

1. Apply a Curve Fit to Data Sets 1 & 2 – use an Inverse Proportion. What is the significance of the coefficient? Compare the coefficients to the torque determined by multiplying balance point *r* and weight *F* of the meter stick (the values measured in Data Set 3).
2. How do the results support the formula for determining torque?
3. Challenge – how could the data be used to create a linear graph? Try it!