Name: _____

Calculation of Torque of Lab Period: _____

Directions:

1. All the measurements and calculations that are to be made are **bolded**.
2. Draw a free body diagram for each situation; indicating the position of the pivot point or fulcrum by a "^" (see Situation #1's FBD for an example) and the lengths of the lever arm.
3. Do all calculations for each situation in the space provided.
4. Estimate all measurements to the nearest tenth of a millimeter
5. All boxes must be checked in order to receive full credit for the lab!

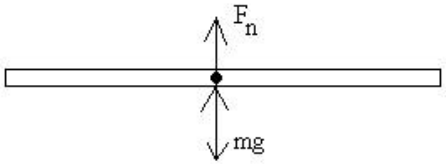
Mass of meter stick: _____

Situation #1: Solve for the Center of Mass of the meter stick

The center of mass of the meter stick is not necessarily at 50 cm! To determine the center of mass, slide the meter stick over the fulcrum until it is balanced. Record the position of the center of mass below.

Position of center of mass: _____

FBD:



Situation #2: Two Masses on Opposite Sides

Set up:

1. Fulcrum at the center of mass
2. Assemble and record the total mass of 0.200 kg + mass hanger + slider
3. Place 0.200 kg + mass hanger + slider **0.10 m** away from the fulcrum
4. Assemble and record the total mass of 0.100 kg + mass hanger + slider
5. Slide 0.100 kg + mass hanger + slider on the other side of the fulcrum until the meter stick is balanced. Record the distance, or lever arm, 0.100 kg + mass hanger is from fulcrum.

Total mass of 0.200 kg + mass hanger + slider: _____

Total mass of 0.100 kg + mass hanger + slider: _____

Final distance (from fulcrum) of 0.100 kg + mass hanger + slider: _____

Draw FBD here:

Situation #2 (cont.)

Given the above data and measurements, **calculate the net torque on the meter stick.** (It should be close to zero.)

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Before moving on, have the instructor check work ☐

Situation #3: 3 Masses; 2 on One Side, One on the Other

DO ONLY IF YOU HAVE TIME

Set up:

1. Fulcrum at the center of mass
2. Assemble and record the total mass of 0.150 kg + mass holder + slider
3. Place 0.150 kg + mass holder + slider **0.15 m** from the fulcrum
4. Assemble and record the total mass of 0.050 kg + mass holder + slider
5. Place 0.050 kg + mass holder + slider **0.35 m** from fulcrum
6. Assemble and determine the total mass of 0.200 kg + mass holder + slider
7. Calculate the distance, or lever arm, that 0.200 kg + mass holder + slider needs to be (on the other side of the fulcrum) in order to balance the meter stick.
8. Slide the 0.200 kg + mass holder + slider to that distance and see if it balances. If not balanced, slide 0.200 kg + mass holder + slider to the position where it does balance and record that lever arm. (It should be close to that which was calculated in step 7.)

Total Mass of 0.150 kg + mass holder + slider: _____

Total Mass of 0.050 kg + mass holder + slider: _____

Total Mass of 0.200 kg + mass holder + slider: _____

FBD (drawn here):

Calculation of lever arm for 0.200 kg + mass holder + slider in order to balance the meter stick

Situation #3 (cont.)

Actual lever arm for 0.200 kg + mass hanger + slider to balance the meter stick:

_____

Before moving on, have the instructor check work ☐

Situation #4: 2 Masses with the Fulcrum off Center

Set up

1. Move the fulcrum **0.15 m** to the left of the meter stick's center of mass
2. Record the mass of one mass slider
3. Place this mass slider a distance of **0.40 m** on the right side of the fulcrum
4. Calculate what amount of mass needed to be placed **0.25 m** to the left of the fulcrum so that the meter stick would be balanced.
5. Assemble this mass (as close as you can get) and record its total mass
6. Place the assembled mass 0.25 m to the left of the fulcrum. If the meter stick does not balance slide the mass + mass hanger + slider until the meter stick balances.

Total Mass of mass slider: _____

Total Mass of the mass + mass hanger + slider: _____

FBD (drawn here):

Calculation of how much mass is needed to balance the meter stick 0.25 m to the left of the fulcrum:

Actual lever arm to balance the meter stick: _____

Before moving on, have the instructor check work ☐
Don't forget to do the questions on the last page!!!

Questions:

What is the advantage of having a wrench with a long handle as opposed to a wrench with a short handle? Why do you think some wrenches are made with short handles?

Many restaurants, stores, shopping centers and such have large signs on top of poles. Why is this a potentially dangerous situation, especially in very windy areas?

You are going to use a ladder to climb up to a second story window and are thinking about what angle you should have the ladder at. What would happen if the angle between the ground and the ladder were too shallow? What would happen if the angle were too steep?

Before moving on, have the instructor check work ☐

You are now done with the lab. Turn the lab in the appropriate class folder.