

21.4: Procedures

You will analyze a see-saw system to determine mass and torque.

Center of Mass

1. Remove the hanging piece from one knife edge clamp. Place this clamp at the center of your meter stick, and use the clamp to place your meter stick onto the fulcrum; it may not balance yet. Adjust the position of the clamp until your meter stick is relatively balanced on the fulcrum. The position of your clamp is the center of mass of the meter stick. Record the center of mass for the meter stick, in centimeters (cm). The center of mass will not necessarily be 50 centimeters.

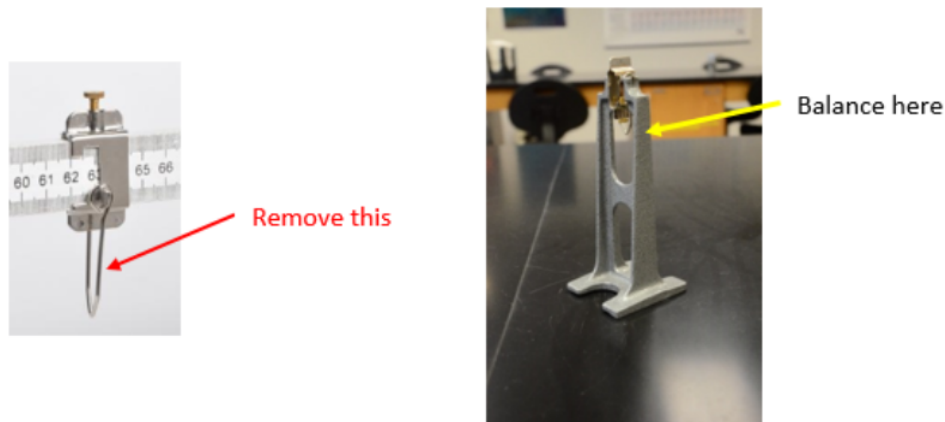


Figure 21.4.1: Knife edge clamp & fulcrum

Unknown Torque

2. Draw a table in which to record data for three systems. **Do not fill in data until you have read the instructions for obtaining that data.**

Table 21.4.1: Balancing Torque Data

Object	Known Mass	Distance 1	Distance 2	Measured Unknown Mass

3. Place knife edge clamps at different distances on each side of the meter stick, such that there is one clamp on each side of the fulcrum. Choose random distances. It is okay if your meter stick is temporarily unbalanced.

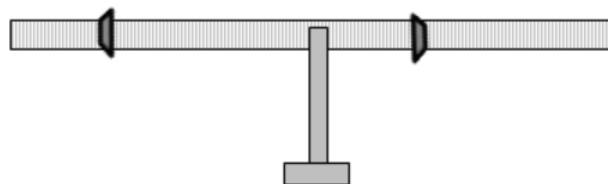


Figure 21.4.2

4. Attach an object (keys, sunglasses, or other object) to one of the knife edge clamps. Add individual slotted masses to the other knife edge clamp until you have balanced the system. As you add the slotted masses, you may need to adjust the positions of the knife edge clamps on either side of the fulcrum, to balance the meter stick. Record the grams of slotted mass that you added to balance the meter stick. Also record the final distances in meters from the fulcrum to each of the knife edge clamps. (see image)

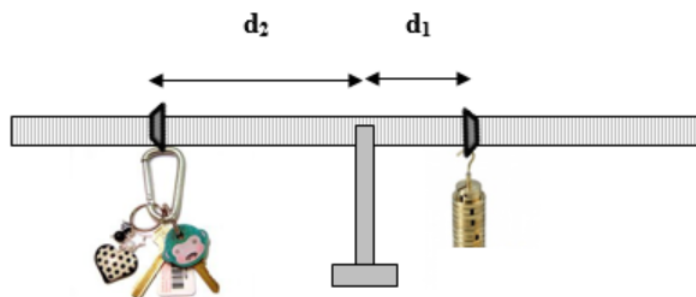


Figure 21.4.3

5. Reposition the two knife edge clamps at new distances and repeat the balancing process for two additional objects. Record your data in your *Balancing Torque* data table.
6. Use the triple beam balance to measure the mass of each object. Record the measured mass of each object, in grams.

Off Center

7. Draw a table in which to record the off center system data. Read the instructions for obtaining the data.

Table 21.4.2: Off Center Data

Mass (kg)	Distance (meters)

8. Adjust the center clamp on the meter stick so that the 75 centimeter mark is located at the fulcrum. Place a knife edge clamp on the short side of the meter stick. Add slotted masses to the knife edge clamp on the short side of the meter stick until the meter stick is balanced. You may need to adjust the fulcrum position slightly in order to balance the meter stick. Once the meter stick is balanced, record the total mass on the short side of the meter stick (slotted mass + mass of the knife edge clamp) and the distance from the fulcrum to the knife edge clamp.



Figure 21.4.4: Copy and Paste Caption here. (Copyright; author via source)

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