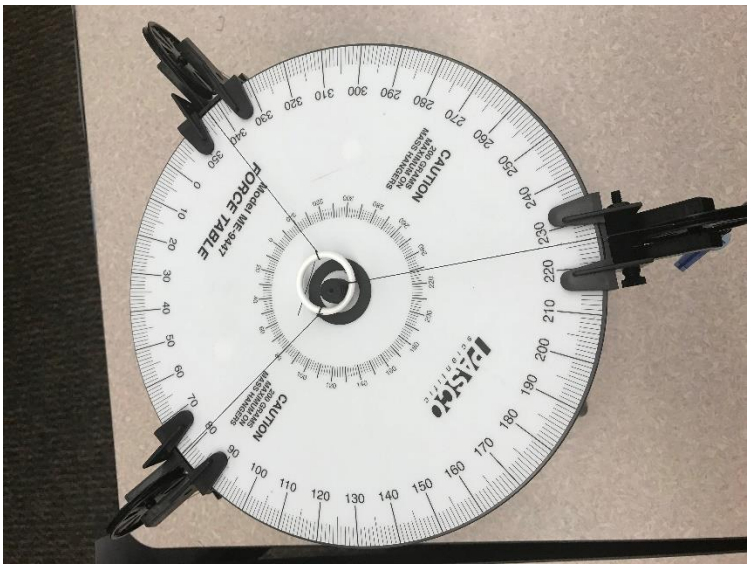
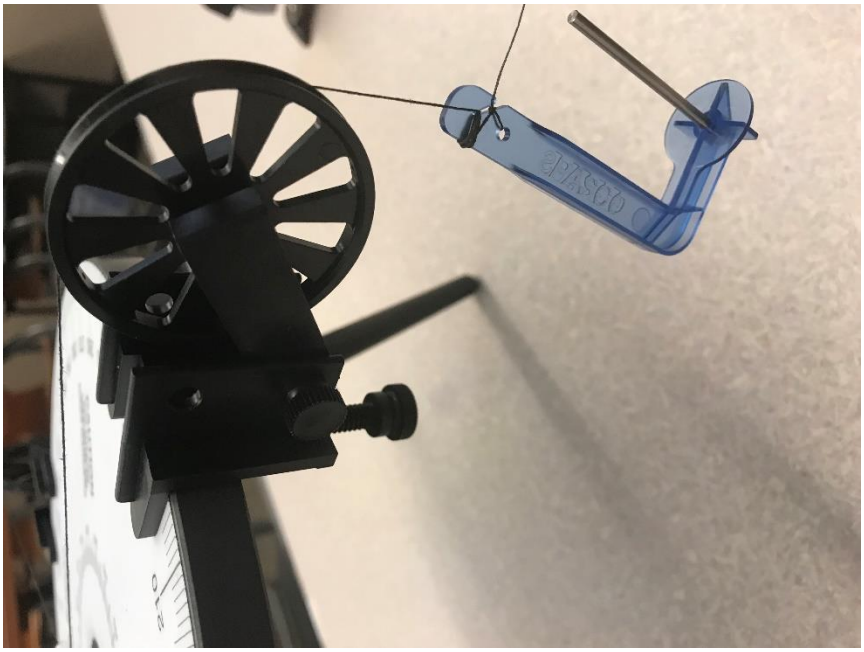
Mini-lab: Forces in equilibrium

Materials at each station—make sure all of this is still there when you leave!

- 1 Triple beam balance
- 1 force table with the following items attached:
  - 3 super pulleys
  - 3 blue mass hangers attached to a central white ring
- Mass Sets:
  - 3 5 g masses
  - 4 10 g masses
  - 8 20 g masses
  - 4 50 g masses
  - 4 100 g masses





Procedure: Force Table

1. Adjust the pulleys so that they are positioned at the angles as listed at your lab station.
2. Slip the white ring over the center bolt, then hang one of the mass hangers over each of the pulleys.
3. Add masses to each of the three mass hangers (carefully!) until you have found a combination which keeps the system in equilibrium. You will know that you've reached equilibrium when the white ring "hovers" around the center bolt without touching it, and with the bolt centered, AND when you can remove the bolt and the ring will always return to the center. Call your instructor over if you're not sure if you've reached equilibrium.
4. After you have reached equilibrium, carefully measure the masses on each hanger using the triple beam balance.
5. **Record the masses and the angles for each mass hanger in the table below:**

	Mass (g) $\Delta m = \pm 0.05$ g	θ=Angle Position of Cord (°)
Cord 1		
Cord 2		
Cord 3		

Average Mass of the blue mass hanger = 5.05 g

Show your answers to the following on the back of this page or on a separate sheet that you will staple to this worksheet.

A. Draw and label a force diagram to show each of the three forces (label the angles, too) acting in the horizontal plane on the white ring at the center of the table.

B. Determine the individual forces of tension in each of the 3 cords. Show your calculations very clearly for each.
C. Add together the vectors you've measured along cords 1 and 2.
D. If your system is in equilibrium, the vector sum of cords 1 and 2 should be equal in magnitude and opposite in direction to the tension in cord 3. Does your data support the idea that your system is in equilibrium? Discuss the accuracy of your values and justify your answer.