Statics Lab

Name _____

Write up your answers to this lab including your calculations. Submit your finished lab in Turnitin.com

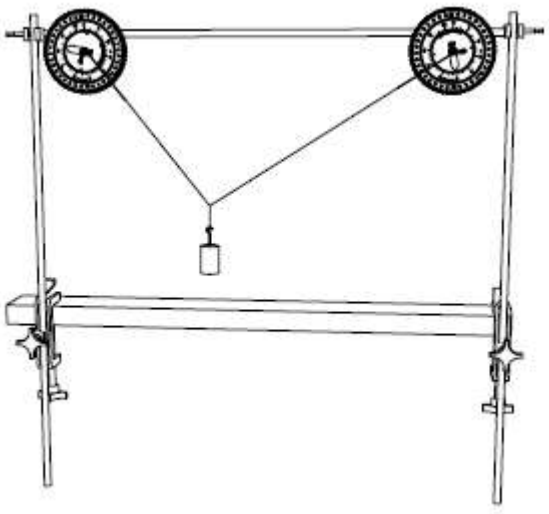
Masses in Equilibrium

$$\%error = \left(\frac{theoretical - measured}{theoretical} \right) x100.$$

1. Two masses are connected to a force table. The first is a 100 g mass hung at an angle of 45°. The second is an 80 g mass hung at an angle of 150°.
    a. Use the force table to determine what mass must be hung at 270° to put the system in equilibrium.
    b. Use the mathematical method (component method) to determine the resultant force required to bring the system into equilibrium (magnitude and direction).
    c. Find the percent error between the masses found in part a and part b.
    d. Why is the direction you found in part b different than the angle specified in part a?
2. Place a mass of 200 grams at an angle of 30° and a second mass of 200 g at 150°.
    a. Use the force table to determine the angle at which a 200 g mass must be placed in order to bring the system in equilibrium.
    b. Use the mathematical method (component method) to determine the angle required to bring the system into equilibrium.
    c. Find the percent error between the angles found in part a and part b.
3. Place a mass of 150 g at 0° and a mass of 200 g at 90°.
    a. Use the force table to determine the angle at which a 200 g mass must be placed in order to bring the system in equilibrium.
    b. Use the mathematical method (component method) to determine the angle required to bring the system into equilibrium.
    c. Find the percent error between the angles found in part a and part b.

Uneven String Lengths

1. Clamp two rods (90 cm long) vertically to the table, approximately 80 cm apart. Attach two Tension Protractors (oriented with zero degrees horizontal) to a cross rod, and clamp this rod between the vertical rods as shown below (but don't attach the mass yet).



2. Zero the force scale of each Tension Protractor: Without anything attached to the Tension Protractor string, adjust the thumb screw in the back until the force scale reads zero.

3. Zero the angle scale of each Tension Protractor: Hang a small mass (10 g) from the hook. Rotate the outer ring to align the 90° mark with the string

4. Cut a string about 60 cm long. Tie a loop about 25 cm from one end so that the string length on one side of the loop is about 20 cm and the string length on the other side of the loop is 35 cm. Tie one end of the string to the wire hook on one of the Tension Protractors and tie the other end of the string to the wire hook of the other Tension Protractor.

5. Hang a 500 g mass from the string loop. Read the magnitude of force and the angle for each string and record them

6. Remove the hooked mass and use a balance to find its exact mass and record it.

7. Repeat steps 5 and 6 for a 200 g mass.

Analysis:

1. Calculate the tension in each string mathematically for the 500 g and 500 g masses using the angles from the experiment.
2. Find the percent error between the calculated tensions and the measured tensions.