

Name: \_\_\_\_\_

**AP Physics: Dynamics  
Tension and Equilibrium Forces**

**Purpose:** During this lab, you will be investigating forces of tension in various equilibrium configurations.

**Materials:**

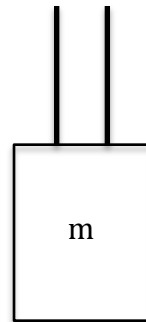
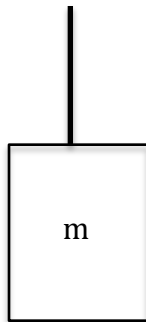
Two ring stands plus one additional bar	Force meters
Clamps	Protractor
Hanging masses	String

**Set-Up:**

- Use two ring stands to support an additional horizontal bar.
- Allow the horizontal bar to be able to be taken in and out of the ring stand configuration.
- Slide a force meter or force meters on to the horizontal bar.
- Hang the appropriate hanging mass from the force meters to experimentally test the configurations shown below.

**Part 1: Getting started**

- Show your calculations for the force(s) of tension shown below supporting a 70.0 g mass. Verify your calculations with your lab set-up using the force meters.
- Use the images below to sketch a FBD.
- Do a percent error calculation for the experiment vs. theoretical values.



Theoretical Value: \_\_\_\_\_

Experimental Value: \_\_\_\_\_

Percent Error: \_\_\_\_\_

*Show percent error calculation below*

Theoretical Values: \_\_\_\_\_

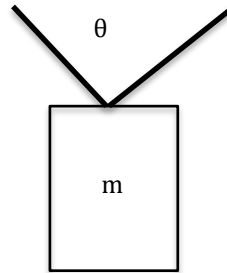
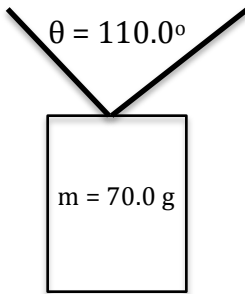
Experimental Values: \_\_\_\_\_

Percent Error: \_\_\_\_\_

*Show percent error calculations below*

**Part II: Getting more complex**

- Calculate the force(s) of tension in the following two scenarios.
- In the first scenario, use a mass of 70.0 grams and an angle  $\theta = 110.0^\circ$ .
- In the second, choose any mass (less than 200 g) and an angle you'd like.
- Again, calculate the theoretical values as well as record the experimental values. Finish with a percent error.
- Consider using a plumb bob to give you a straight vertical line through your angle  $\theta$ .
- Use either tape or more clamps to hold the angle of the force meters



Theoretical Values: \_\_\_\_\_

Experimental Values: \_\_\_\_\_

Percent Error: \_\_\_\_\_

*Show percent error calculations below*

Mass Used: \_\_\_\_\_

Angle Used: \_\_\_\_\_

Theoretical Values: \_\_\_\_\_

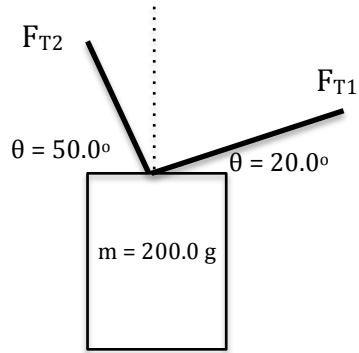
Experimental Values: \_\_\_\_\_

Percent Error: \_\_\_\_\_

*Show percent error calculations below*

**Part III: The last one!**

- Calculate the force of tension  $F_{T1}$  and  $F_{T2}$  supporting a 200.0 g mass as shown in the figure provided.
- Record your theoretical values before setting up the equipment.
- Record the experimental values and do a percent error calculation.



Theoretical Value for  $F_{T1}$ : \_\_\_\_\_

Experimental Value for  $F_{T1}$ : \_\_\_\_\_

Percent Error: \_\_\_\_\_

*Show percent error calculation below*

Theoretical Value for  $F_{T2}$ : \_\_\_\_\_

Experimental Value for  $F_{T2}$ : \_\_\_\_\_

Percent Error: \_\_\_\_\_

*Show percent error calculation below*