Lab #2

Resolution of Forces

Mayer Adelman

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Mayer Adelman

Lab 3

Purpose

To find three forces that are in equilibrium using the resolution of forces.

Theory

For forces to be at equilibrium, the sum of all the forces must equal 0. This means that both the vertical components and horizontal components must cancel each other out.

Resolution of forces means taking a known force and breaking it down into individual forces or vectors acting on a certain point, and then isolating the triangle which was was formed by the combination of the 3 forces, and using trig rules to determine the value of the hypotenuse of the right triangle.

Materials

1. Bar
2. Ring Stand
3. Weight
4. Spring Scale
5. String
6. Collar
7. Clamp
8. Ruler

Procedure

1. Attach the spring scale to the ring stand with the collar. Attach a string from the spring scale to the other end of the bar, which forms a cord.
2. Attach the bar to the ring stand with the clamp.
3. Attach a string from the spring scale to the other end of bar. The bar should form a 90º angle with the ring stand.
4. At the end of the bar hook the weight
5. Record the measurements on the spring scale.
6. Measure the length of the bar.
7. Measure the length of the ring stand from the clamp attached to the bar to the collar attached to the spring scale.
8. Once both the horizontal (bar) and the vertical (the pole are of the ring stand) measurements are known, use SOH-CAH-TOA to solve for the angle.
9. To solve for the force of φ (the vertical force of the mass), add the weight of the mass (2.21 N) and half the weight of the bar (since the cable is only supporting HALF the weight of the bar)
10. Use Trig functions to solve for T

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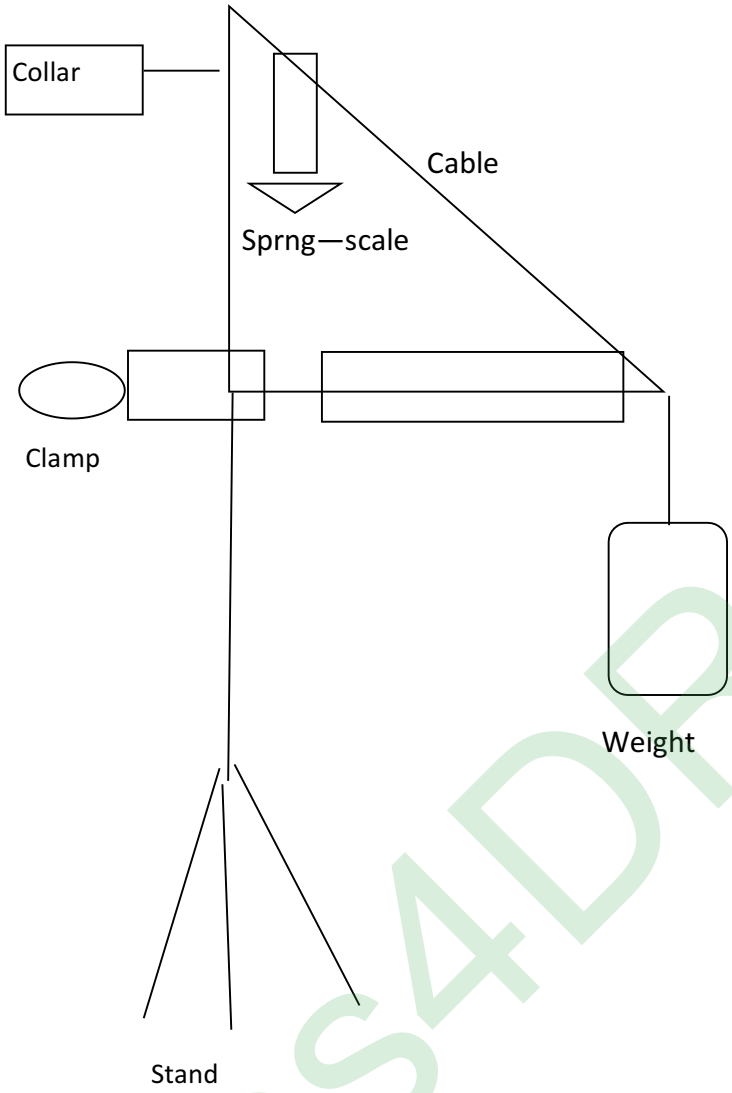
Diagram



Data

Mass of the “weight”=200g=.2 kg

F=ma

W=mg

Weight of the “weight”=(9.8)x(.2)=1.96 N

Total weight of the bar=.5 N

Half the weight of the bar=.25 N

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Lab 3

Weight of the bar and "weight"=1.96 N+ .25 N=2.21 N

Length of bar=56 cm

Angle formed by cable and bar=45º

Let Tx=B

Tan(45)=$\frac{2.21}{Tx}$

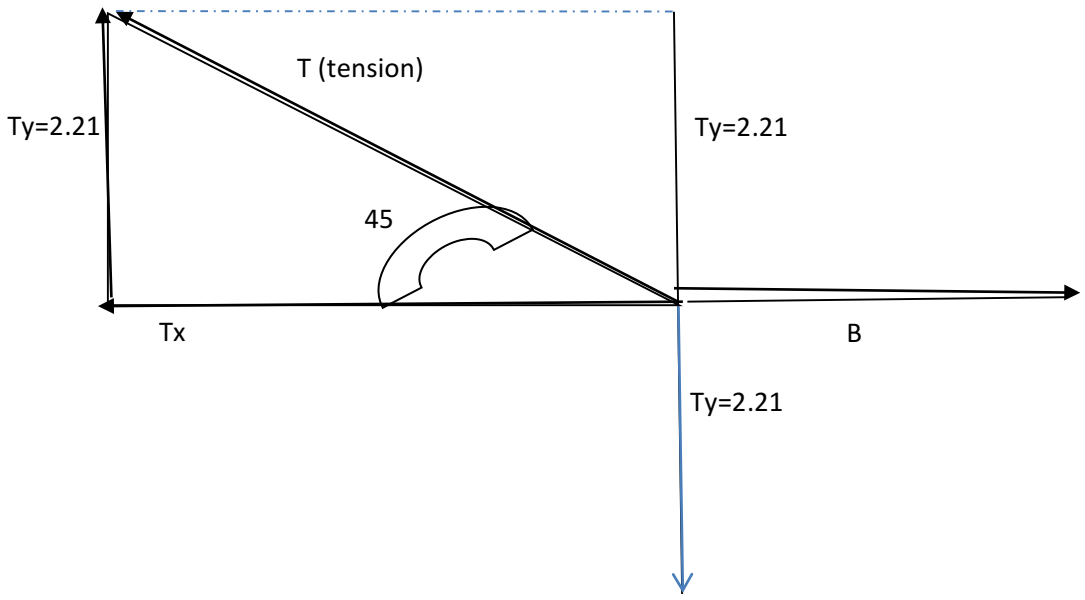
1=$\frac{2.21}{Tx}$

Tx=2.21=B

T=$\frac{2.21}{\sin(45)}$=3.125

Recorded force of T=3.1 N

Percent error=$\frac{3.125-3.1}{3.1}$=.81% '



Conclusions and Discussion of Results

This lab has taught how to use resolution of forces to determine each individual force and show how they cancel out to equilibrium.