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Science, Physics

February 25, 2013 Lab: Equilibrium of Forces Purpose/Objective: The objective of this lab was to test the first condition of equilibrium for a set of concurrent coplanar forces, prove Lami's Theorem, and to determine an unknown mass using rules of equilibrium. Procedure: In the lab, we wanted to find at what angles three separate weights would create a net zero force on a force table so that the ring holding the weights was exactly centered in the middle of the table. In Part 1, Set three pulleys at positions Î¸ = 0, 120, and 240. We then had to determine the value of the weights w1, w2, and w3 that bring the system to equilibrium. In Part 2 we set three pulleys at positions Î¸ = 0, 110, and 260. We then had to determine the value of the weights w1, w2, and w3 that brings the system to equilibrium. In Part 3, we use an unknown mass as w3. We then had to determine the value of the weights w1 and w2, and angles Î¸2 and Î¸3 that brings the system to equilibrium. We then had to find the value of w3. Experimental Data: Part 2 Force | Fn | Î¸n | Fncos Î¸ | Fnsin Î¸ | F1 | 100N | 0 | 100 | 0 | F2 | 205N | 110 | -70 | 193 | F3 | 200N | 260 | -35 | -197 | âˆ‘ Fx = -5 âˆ‘ Fy= -4 Part 3 Force | Fn | Î¸n | Fncos Î¸ | Fnsin Î¸ | F1 | 100N | 0 | 100 | 0 | F2 | 140N | 100 | -24 | 138 | F3 | w3=? | 240 | -76 | -132 | âˆ‘ Fx= 0 âˆ‘ Fy=-6 Calculations: W3= (-100cos0 — 140cos100)/cos240 W3= (-100+24)/-. 5 W3= 152N Results: Actual weight of w3= 160. 29N Percent error = 152-160. 29 x 100 = 5. 17% 160. 29 Discussion: Overall I think that our experiment was fairly successful with only a 5. 17%. The weight that we got through our calculations came out to be 152 while the actual weight was 160. 29. Also the sums of Fx and Fy should both net to zero and in our experiment we got pretty close with values of 0, -4, -5, and -6. There could have been many factors contributing

to the percent error in our data and calculations. I believe that the biggest contributor to error would be setting the force table to equilibrium by eye by determining the correct weight and angle of each pulley. We had to determine when we believed the ring was exactly in the middle so there could have been wrong data collected in both cases. Summary: In this lab I learned that a set of forces acting upon a particle will hold that particle in equilibrium provided the vector sum of those forces is equal to zero. A force is a push or pull exerted on an object. A force has both a magnitude and a direction. A pull can be exerted through a string and weight . Gravity can also exert a pull on an object. This gravitational force on the object is the object’s weight. The weight of an object is always directed in the downward vertical direction. Equilibrium occurs when the sum of all components in the horizontal direction equals zero and the sum of all components in the vertical direction equals zero.