

Week 3: Vectors

In this lab experiment, you will investigate whether forces add like vectors. You will also practice vector addition graphically and by components.

1. To familiarize yourselves with the force table, hang equal weights (say, 100g) on three hangers and vary the angles until the three weights balance. Sketch the top view of the table and write down your results.
2. Hang a total mass of 150g @ 0° and 240g @ 60° (Remember to include the mass of the hangers).

Problem: Determine the one mass that will balance the two masses.

- a. By experiment
 - b. By adding vectors graphically using graphing paper, a ruler and a protractor. Make sure you indicate your scale (e.g 1cm corresponds to x grams).
 - c. By calculating the components of the vectors. (It is most convenient to call the $0^\circ - 180^\circ$ line the x-axis and the $90^\circ - 270^\circ$ the y-axis.)
 - d. Compare your answers for a. b. and c. What law of physics do your results support?
3. Hang (a total mass of) 200g @ 90° , 160g @ 0° , and 250g @ 200°

Problem: Predict the fourth mass that will balance the three masses.

- a. By calculating the balancing force (weight and angle) analytically.
 - b. Check your results experimentally.
4. Hang a total mass of 400g @ 240° .

Problem: Balance this force by two appropriate weights, one at 0° and one at 90°

- a. analytically.
 - b. Check your results experimentally.
5. Hang a total mass of 200g @ 180° .

Problem: Balance this force by two appropriate weights, one at 30° and one at -45° ,

- a. analytically.
- b. Check your results experimentally.