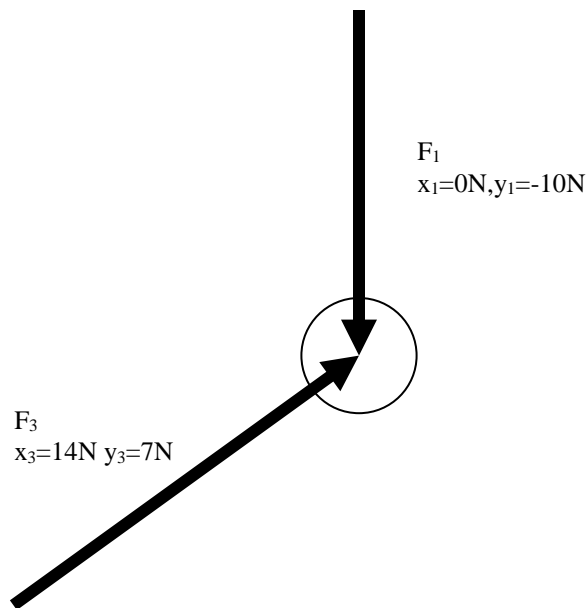


Forces Lab

Purpose: to reinforce vector concepts using computer simulated forces

Procedure:

- 1) Using the interactive physics player program in the library open sim 12. This represents a puck with three forces acting upon it. Acceleration in x and y directions as well as the components of each force vector are shown at the top.
- 2) Run the simulation and sketch the observed motion of the object.
- 3) Using vector principles find and record
 - A: net force in x-direction (by adding x-comp of each force)
 - B: net force in y-direction (by adding y-comp of each force)
 - C: magnitude and direction of net force (by adding x and y-comps)
- 4) Calculate and record the mass of the puck using Newton's Second Law.
- 5) Change the values of F1 (x & y comp) so that $F_{net} = zero$. Record the values. Run the experiment to verify your calculations.
- 6) Change the y-comp of F2 to zero and run the simulation, record the motion of the puck.
- 7) Calculate and record a new y-comp of F1 to return the puck to equilibrium. Run the experiment to verify your calculation.
- 8) Change the initial velocity to 3.00 m/s and run the experiment again, record the accelerations.
- 9) Copy the diagram below, and solve it graphically to find a missing force that would create equilibrium.



- 10) Alter the components of the force you calculated to arrive at an acceleration of 2.23 m/s^2 , with $a_x=1.00 \text{ m/s}^2$ and $a_y=2.00 \text{ m/s}^2$. Use the mass found in step 4.
- 11) Verify your calculations using the simulation.

Discussion:

- 1) Can an object be in motion and have a net force of zero? Explain.
- 2) Explain how to calculate the magnitude and direction of a (force) vector given its x and y components.
- 3) Define the word EQUILIBRANT in reference to forces and F_{net} .

Do a meaningful conclusion relating vector components, adding vectors, and F_{net} .