

## Adding Forces

### Description

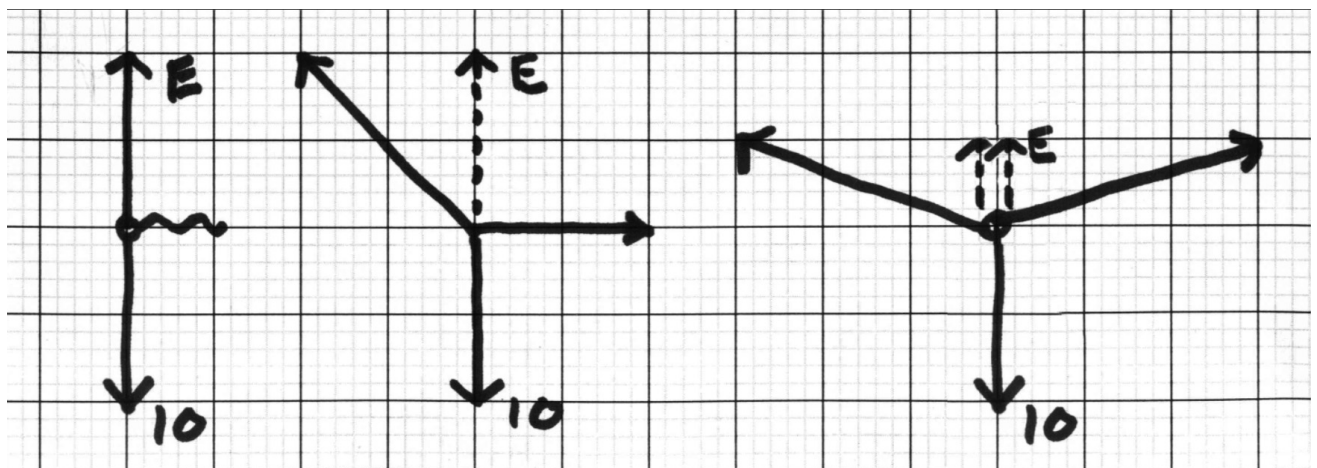
This project is intended to give a sense how forces combine in a system of equilibrium. A selection of 3 force equilibrium systems are modeled both physically and graphically to verify hand calculations.

### Goals

- To model two component forces of an equilibrant in tension using a physical model.
- To show the vector addition of the same 2 forces to find the resultant
- To make hand calculations of the same vector addition.

### Procedure

1. Using a piece of string with some weight tied to the middle; hold the two string ends at  $0^\circ$  and  $90^\circ$  (horizontal and vertical). Observe that the horizontal is slack (no force in the string). Your hand on the vertical string is the equilibrant force to the force of gravity acting on the weight.
2. Move the vertical string so one string is at  $45^\circ$  and the other at  $0^\circ$  (horizontal).
3. Make a scaled sketch of equilibrant force (opposite to the weight) and its 2 component forces (the two strings in your hands). Scale the *force* not the string. Assume the weight to be 10 units. Scale the forces on the graph paper and estimate the force magnitude of each of the two component forces.
4. Use either trigonometry or similar triangles to calculate the forces in the strings. Compare your results with the graphic result.
5. Try another variation like the third figure below.
6. Try to pull the 2 strings horizontal (don't break the string). Observe that there tends to be a small sag in the string even when pulled fairly taut.



### Due

During Recitation

