

Vector Addition of Forces

Purpose: To study vector addition by:
1) Graphical means and by
2) Using components.
A circular force table is used to check results.

Equipment: Circular force table, masses, mass holders, string, protractor, four pulleys.

Procedure:

1. Your instructor will give each group three masses (which will represent forces) and three angles. Choose a scale which is convenient for the size of your graph paper and make a vector diagram showing these forces and graphically find their resultant. Determine the magnitude (length) and direction (angle) of the resultant using a ruler and protractor. Record all four vectors (length and angle).
2. Make a second vector diagram and show the same three forces again, placing all of their tails at the origin. Find the resultant vector again, this time by using components. Show this vector on your diagram. What force (vector) would you need to exactly cancel out this resultant? Ask your instructor to check your results before going on.
3. Mount three pulleys on the edge of your force table at the angles given above. Attach strings to the center ring so that they each run over the pulley and attach to a mass holder as shown in the figure below. Place the appropriate masses (numerically equal to the forces in grams) on each mass holder. Is the ring in equilibrium? Set up a fourth pulley and mass holder at 180 degrees opposite from the angle you calculated for the resultant of the first three vectors. Record all mass and angles. If you now place a mass on this fourth holder equal to the magnitude of the resultant, what happens?
4. Discuss any source of errors that might affect your results.

