Name_____

VECTOR ADDITION

In this experiment we will add vectors experimentally by first using a force table, then by using a graphical method (head-to-tail method), and finally by using the analytical method (the component method).

The Force Table

The force table is an apparatus that allows one to experimentally determine the resultant of force vectors. The forces are applied by hanging masses over pulleys positioned at certain angles. Adding or removing slotted weights varies the magnitude of the force, and moving the pulley varies the direction.

The resultant of two or more vectors is found by balancing the force with another force called the equilibrant **E.** The equilibrant is not the resultant **R**, but a force equal in magnitude but opposite in direction to the resultant. **R = -E**.

Procedure

1. For the following force vectors below, find the vector sum by using the force table.
2. Add the vectors by using the graphical head-to-tail method. Show the diagram's measure to scale
3. Next, add the vectors analytically by using the component method. Show all of the steps.
4. For all three methods, leave the units as grams as they are proportional to weight.

Results

	Forces (grams)*	Equilibrant, **E** (grams) (magnitude and direction)	Resultant, **R** (grams) (magnitude and direction)
Vector addition 1	$F_1 =$ 100, 30° $F_2 =$ 100, 120°		
Vector addition 2	$F_1 =$ 100, 20° $F_2 =$ 100, 80°		
Vector addition 3	$F_1 =$ 100, 0° $F_2 =$ 150, 90°		
Vector addition 4	$F_1 =$ 75, 30° $F_2 =$ 150, 90° $F_3 =$ 50, 200°		

* "Dynes" and "Newtons" are metric force units. However, in this case we can express units in grams since weight and mass are proportional to each other.

1. Attach analytical calculations. Show all of the steps.
2. Attach graphs drawn to scale.