**Equilibrium of Forces Acting at a Point**

**Aim:**

In this experiment, we shall determine the sum of two forces, an amount and a direction in three methods, practical, graphical, and analytical.

**Tools:**

1. Force table.
2. Small ring.
3. Weights (slotted masses).
4. Pully.
5. Weight hanger.

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|  |
| Force table |

**Theory:**

Physical quantities are classified into two classes:

1-Non-directional quantities (scalars), which are quantities that have a numerical value only, such as energy, mass, time, etc., and these quantities are added algebraically.

2- Directional quantities (Vectors), which are quantities that have a magnitude and direction such as force, velocity, etc., These quantities are added directionally.

Forces are one of a group of quantities known as vectors.

An object is in translational equilibrium when the vector sum of all the forces

acting on it is zero. And it is known that if three directional quantities affect a body (i.e., they meet at one point) and they are in a state of equilibrium, the sum of two of them is equal to the third vector in magnitude and opposite to it in direction.

**Method or Procedure:**

1. The practical method: by using the force table.

**Table force:** It is a disc amphitheater 360-degree with a center attached to it three forces be in equilibrium.

1. Suspend the first and second forces on the weight hanger then hang the third force not that: the three forces are not equal ().
2. Change the angles to get the equilibrium condition of the disk not that the three angles are not equal (α≠β≠γ(and It should be noted that the sum of these angles must be 360֯ (α+β+γ=360֯).
3. Where: F1, F2, F3 are the first, second, and third forces, respectively.

 It is the angle between the second and the third force and opposite the first force.

 It is the angle between the first and the third force and opposite the second force.

 It is the angle between the first and the second force and opposite the third force.

1. You have to nots that F= mg ………. (1)
2. Analytical method: It is the arithmetic method by using the law below called the law of cosines:

………….(2)

…………... (3)

………….(4)

1. Graphical method: by setting an appropriate scale so that we must consider each 10 newtons to be 1 centimeter in drawing When the two vectors (F1, F2) are represented by two arrows starting from one point, their length corresponds to and is proportional to the values ​​of these two forces, determine the angle between them and complete the parallelogram, then the diameter represents the result (F3) as in the figure below:



**Questions:**

1. What is the definition of equilibrium?
2. What are the conditions for equilibrium of force?
3. What is the force?
4. What happens when several forces act on a point?
5. What is the Resultant force?
6. What is newton (N)?
7. What is the definition of weight?