**PITSI TM (202174700) 19 MAY 2021**

**SPHS000 TUESDAY GROUP**

**Experiment 1.3**

**Forces in equilibrium**

**AIM:**

* To verify that force is a vector quantity.
* To find the weight of a given body using the Parallelogram Law of Vectors.

**Introduction:**

Forces are one of a group of quantities known as vectors, which are distinguished from regular numbers (known as scalars) by the fact that a vector has two quantities associated with it, a magnitude and a direction (related to a coordinate axes of the system you are dealing with). These properties completely characterize a vector. A vector may alternatively be described by specifying its vector components. In the case of Cartesian coordinate system (the system we will be primarily dealing with) there are two components, the x-component and the y- component.

**Materials:**

* Parallelogram Law of Forces apparatus (Gravesand`s apparatus)
* Plumb line
* Two hangers with slotted weights
* A body (a wooden block) whose weight is to be determined
* Thin strong thread
* White drawing paper sheet
* Drawing pins
* Mirror strip
* Sharp pencil
* Half meter scale
* Set squares
* Protractor

**Methods:(As performed through the Online Labs)**

* Click on any of the object to select it.
* You can change the hanging weights both on the right and left side, using the slider.
* Click on the show parallelogram button that gives you the parallelogram based on the weights on the left and right.
* Click on the show protractor button and measure the angle AOB using protractor.
* Use the show scale button to use the scale to take the diagonal length of the parallelogram.
* Calculate the value of the unknown mass using equation (1) and the value of OD \*20gm using equation (2) and find its mean value.
* Enter the unknown weight (mean value) of the object in the text box provided to check your answer.

**Results:**

Table 1

|  |  |  |  |
| --- | --- | --- | --- |
| **Force** | **Mass**  M | **Force**  Mg | **Scale length** |
|  | (kg) | (N) | cm |
| **F1** | 0.0600 | 0.589 | 3.0 |
| **F2** | 0.0700 | 0.687 | 3.5 |
| **F3** | 0.0840 | 0.824 | 4.2 |
| **S=|F1|+|F2|** | **(algebraically)** | 1.276 | ############## |
| **|R|=|F1|+|F2|** | **(parallelogram)** | 0.824 | 4.2 |

3. R- vector

4. They are closely parallel to each other because they coincide.

5. It is a vector because it has magnitude and direction.

6. :

0.1cm:2g

01cm=1mm

1mm:2g

[=2\*10-3

F=mg

F=(2.00\*10-3)(9.81)

F= 0.020N

1mm:0.020N

Table 2

|  |  |  |  |
| --- | --- | --- | --- |
| Angle  **(degrees)** | Forces | X- component | Y- component |
| (◦c) | (N) | (N) | (N) |
| **θ1**= 144◦ | F1= 0.589 | -0.477 | 0.346 |
| **θ2**= 47◦ | F2=0.689 | 0.469 | 0.502 |
| **θ3**=270◦ | F3= 0.824 | 0 | -0.824 |

|  |  |  |
| --- | --- | --- |
| Resultant force components | **Rx**= -8\*10-3 | **Ry**= 0.024 |

7. R2= R2+R2

R2= (-8\*10-3)2+(0.024)2

R=

R=

R=0.025



θ =

θ =-71.57

8. \*100=0%

9.

10.

11. **Precautions**

**Conclusion:**

Force has been verified as a vector quantity because all the force have been acquired while performing the experiment. They all act at the certain direction, each and every single force that was applied they have a certain direction and magnitude, Also to find the weight of the given body using the parallelogram laws, we have been able to calculate the mass of the stone using the parallelogram laws.

**Reference:**

https://www.webassign.net