ElCoM
ELECTRICAL COMPUTER MECHATRONICS

تقدم لجنة ElCoM الاكاديمية

ريبورتات لمختبر :

الفيزياء العامة العملية

Vectors (Force Table)

The values we will be working on are in the following table:

Mass (g)	Weight (N) = mass × 9.8	Direction (°)	Name
85	0.833	35	F_1
155	1.519	240	F_2
105	1.029	330	F_3
156.5	1.5337	120	F_r

We can find F_x and F_y from **sin** and **cos**.

$$\sin(Direction) = \frac{F_y}{Weight\ (N)} \quad \left| \quad \cos(Direction) = \frac{F_x}{Weight\ (N)} \right.$$

$F_1 = F_x\,\hat{\imath} + F_y\,\hat{\jmath}$

$F_1 = 0.682\,\hat{\imath} + 0.477\,\hat{\jmath}$

$F_1 = 0.833\text{N}, 35^o$

$F_2 = F_x\,\hat{\imath} + F_y\,\hat{\jmath}$

$F_2 = -0.759\,\hat{\imath} - 1.315\,\hat{\jmath}$

$F_2 = 1.519\text{N}, 240^o$

$F_3 = F_x\,\hat{\imath} + F_y\,\hat{\jmath}$

$F_3 = 0.891\,\hat{\imath} - 0.5145\,\hat{\jmath}$

$F_3 = 1.029\text{N}, 330^o$

$\sum F_x = 0.682 - 0.659 + 0.891 = 0.814$ (N)

$\sum F_y = 0.477 - 1.315 - 0.5145 = -1.3525$ (N)

$|F_r| = \sqrt{(\sum F_x)^2 + (\sum F_y)^2} = \sqrt{(0.814)^2 + (-1.3525)^2} = 1.578$ (N)

$|F_r|$: the magnitude of resultant force.

$\theta_R = \tan^{-1}\left(\frac{\sum F_y}{\sum F_x}\right) = \tan^{-1}\left(\frac{-1.3525}{0.814}\right) = 301.5$

θ_R : the direction of resultant force.

The equilibrant force (N) = Mass * 9.8

Mass = 151.5 + Hanging masses (5) = 156.5

Convert (g) to (Kg) = $156.5 * 10^{-3} = 0.1565$

The equilibrant force (N) = 0.1565 * 9.8 = 1.5337

The equilibrant force (N) = The resultant force (N)

P.E (For components results) = $\frac{|Compnent\ result\ (N) - Experimental\ result\ (N)|}{\left(\frac{Compnent\ result\ (N) + Experimental\ result\ (N)}{2}\right)}$

P.E (For components results) = $\frac{|1.578-1.5337|}{\left(\frac{1.5337+1.578}{2}\right)} \times 100\% = 2.847\%$

P.D (For graphical results) = $\frac{|Graphical\ result\ (N) - Experimental\ result\ (N)|}{\left(\frac{Graphical\ result\ (N) + Experimental\ result\ (N)}{2}\right)}$

P.D (For graphical results) = $\frac{|1.8-1.5337|}{\left(\frac{1.8+1.5337}{2}\right)} \times 100\% = 15.9\%$

Insert the calculated values in the following table:

Resultant Force	Experimental Results	Graphical Results	Components Results
Magnitude (N)	1.5337	1.8	1.578
Direction (θ_R)	300	320	301.05
Percent Difference for Graphical results %		15.9%	
Percent Error for Components results %		2.847%	

*Graphical solution should be attached to the report.

Forces	Components Results	Equilibrant Results
Magnitude (N)	1.578	1.578
Direction (θ_R)	301.05	121.05

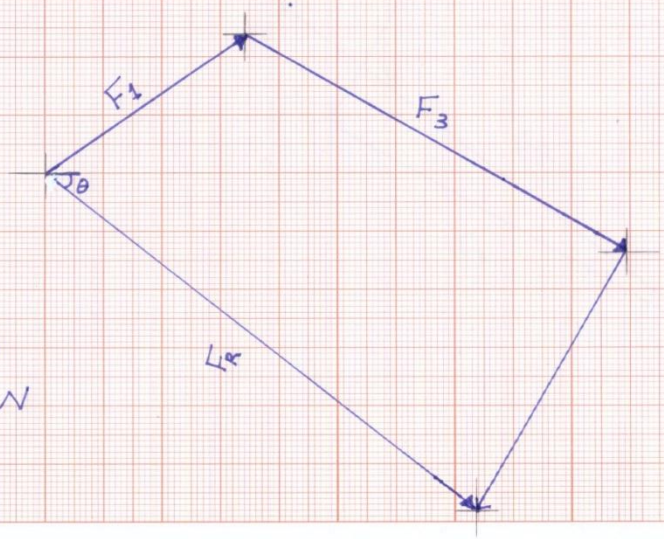
*Note: The resultant and the equilibrant forces are same in magnitude and opposite in directions.

Please write the calculations in detail and then fill in the table.

By : MOHAMMED H ABADI

at scale

0.2 (N) = 1 cm



$\theta = 320^\circ$

$F_R = 9$ cm

≈ 1.8 N