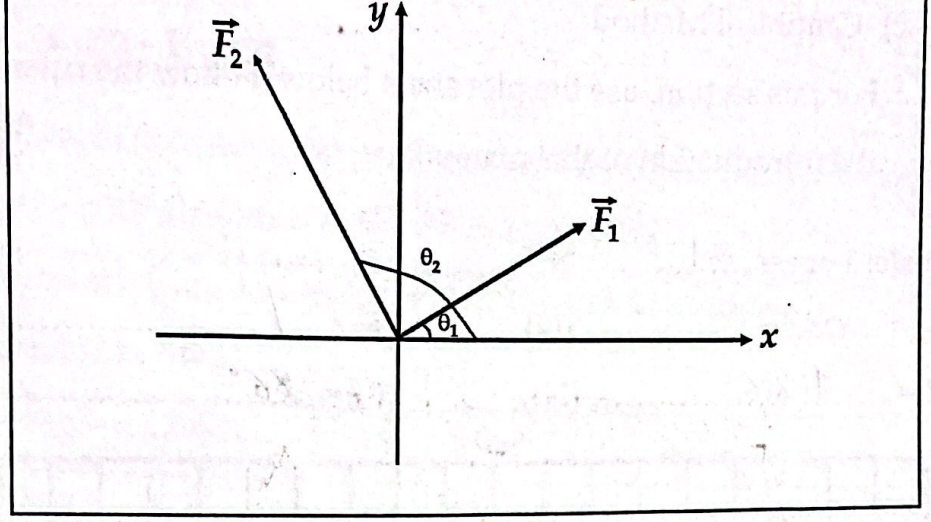


Figure 3.5: Schematic setup of forces in part 1 (for the case $m_1 < m_2$)

- With the use of a third pulley and a third hanging mass find the magnitude and direction of the equilibrium force that returns the ring to the equilibrium position. This third force is called the balance force; it is equal in magnitude and opposite in direction to the resultant of the two forces.

V. DATA ANALYSIS – PART 1

Find the resultant of the above two forces (magnitude, R and direction, θ_R) by:

a) Experimental method (Force Table)

Balance force (B)=	125 ×g= 1.25 N	θ_B = 266°
Resultant (R)=	125 ×g= 1.25 N	θ_R = 86°

b) Method of Components

$m_1 = 80\ g$, $\theta_1 = 35°$ → $F_1 = mg = \frac{80}{1000} * 10 = 0.8\ N$

$m_2 = 100\ g$, $\theta_2 = 125°$ → $F_2 = mg = \frac{100}{1000} * 10 = 1\ N$

$R_x = F_{1x} + F_{2x}$

$= 0.8 \cos 35 + 1 \cos 125$

$= 0.082$

$R_y = F_{1y} + F_{2y}$

$= 0.8 \sin 35 + 1 \sin 125$

$= 1.3$

$R = \sqrt{(0.082)^2 + (1.3)^2} = 1.30\ N$, $\theta = \tan^{-1}\left(\frac{1.3}{0.082}\right) = 86.4°$

c) Graphical Method

For this section, use the plot sheet below. Follow the rules explained in the introduction of this manual.

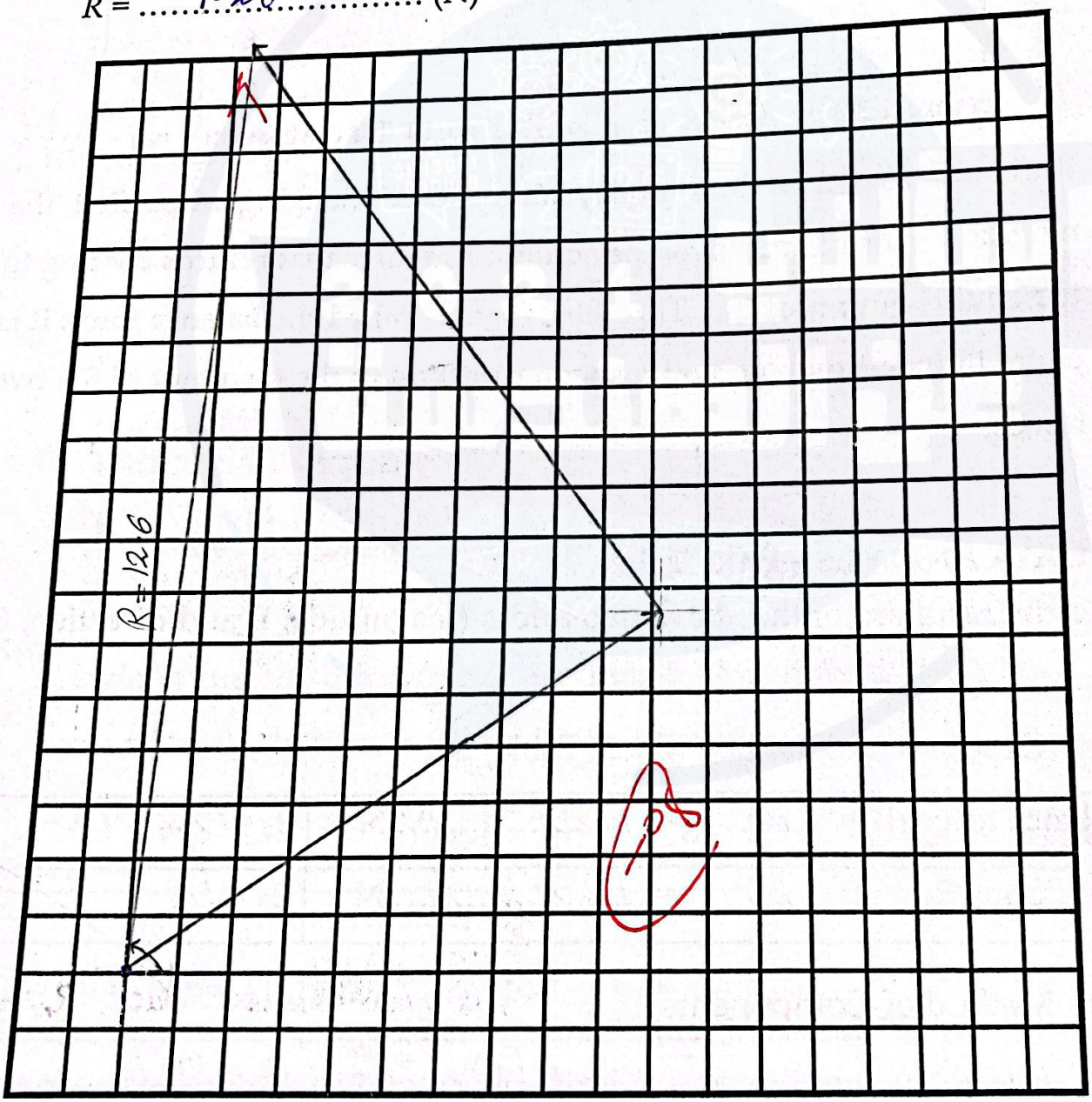
Scale: 1 cm = 0.1 N

F_1 = 0.8 (N)

F_2 = 1 (N)

R = 1.26 (N)

θ_R = 86°



VI. PROCEDURE - PART 2

1. Follow the procedure in part 1 above to find the resultant of the three forces with directions as shown in Figure 3.6.

Use the masses m_1, m_2, and m_3 (provided by your instructor).

Fill in the table below.

$F_1 = w_1 = m_1 g$ = ...1.2..... N	θ_1 = 25
$F_2 = w_2 = m_2 g$ = ...1.5..... N	θ_2 = 300
$F_3 = w_3 = m_3 g$ = ...1..... N	θ_3 = 140

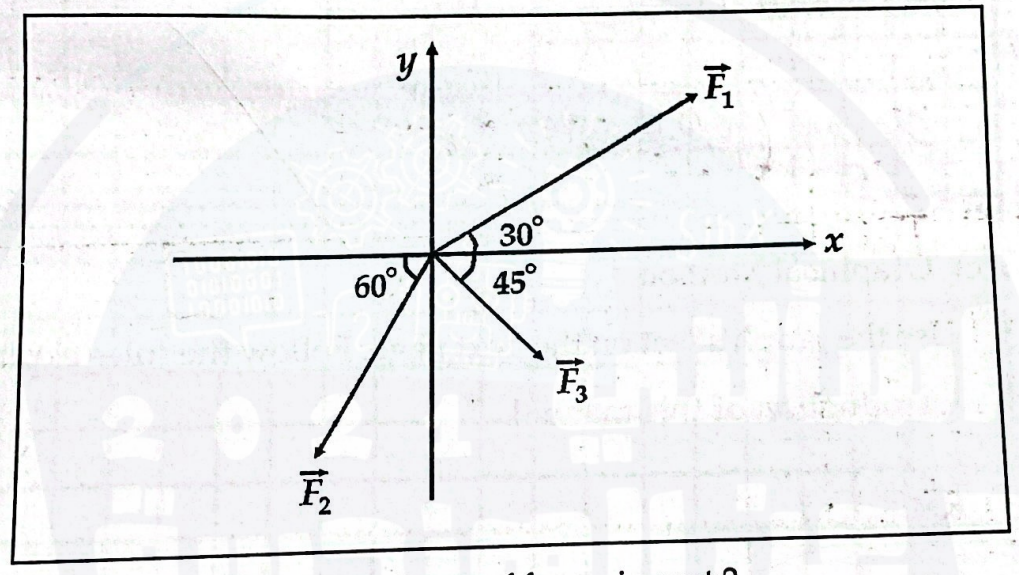


Figure 3.6: Setup of forces in part 2.
(The angles you will use are not necessarily the same as in the figure)

VII. Data Analysis – Part 2

1. Find the resultant of the above three forces (magnitude, R, and direction, θ_R)

a) Experimental method (Force Table)

Balance force (B) =	.110. × g= ....1.1..... N	θ_B = 172°
Resultant (R) =	110. × g= ....1.1..... N	θ_R = 352°

$f = mg$

b) Method of Components

$m_1 = 120\ g$, $\theta_1 = 25^\circ$ $\rightarrow F_1 = 1.2\ N$

$m_2 = 150\ g$, $\theta_2 = 300^\circ$ $\rightarrow F_2 = 1.5\ N$

$m_3 = 100\ g$, $\theta_3 = 140^\circ$ $\rightarrow F_3 = 1\ N$

* $R_x = F_1x + F_2x + F_3x = 1.07\ N$

* $R_y = F_1y + F_2y + F_3y = -0.15\ N$

$R = \sqrt{(1.07)^2 + (-0.15)^2} = 1.08\ N$

$\theta = \tan^{-1}\left(\frac{-0.15}{1.07}\right) = -7.98 \Rightarrow 352^\circ$

7.98

360 − (7.98)

= 352°

c) Graphical Method

Use the graph sheet on the next page. Follow the rules explained in the introduction of this manual.

$R =$ .....

$\theta_R =$ .....

2. State and discuss three sources of error in this experiment.

1) use the instruments wrongly

2) read wrong

3) make wrong calculation

friction

-0.5

Scale: 1 cm = 0.2 N

F_1 = 1.2 N → 6 cm

F_2 = 1.5 N → 7.5 cm

F_3 = 1 N → 5 cm

R = 1.1 (N)

θ_1 = 25

θ_2 = 300

θ_3 = 140

θ_R = 352°