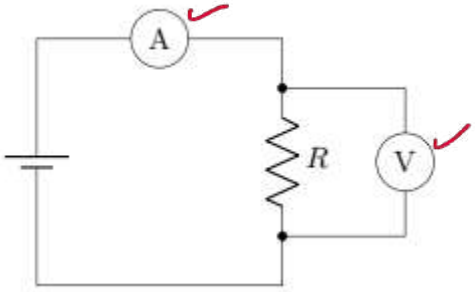
Experiment Title:

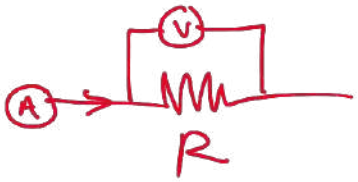
Ohm's Law

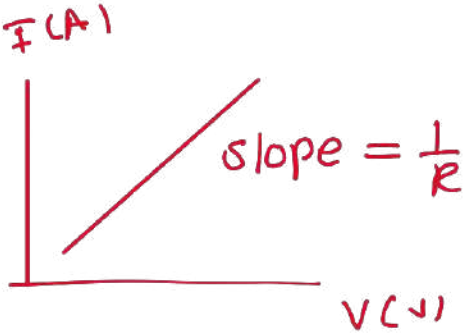


$V = IR$

$R = \frac{V}{I}$

$I = \frac{V}{R}$





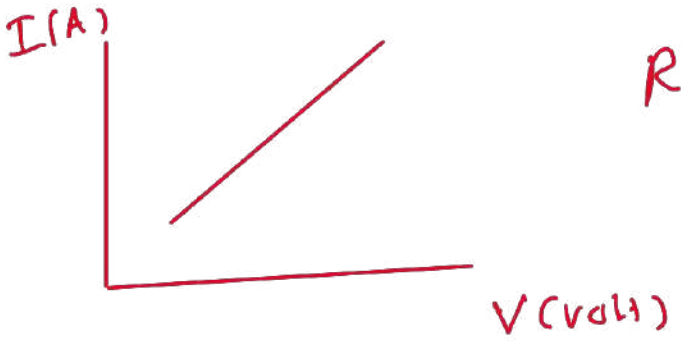
$R = \frac{1}{\text{slope}}$

1. OBJECTIVE

To verify Ohm's law by finding the resistance of a resistor and comparing it to its known value.

2. THEORY

$$V = RI$$



$$R = \frac{1}{\text{slope}}$$

EQUIPMENTS

DC power supply – Ammeter – Voltmeter – breadboard - resistors – connecting leads.

3. ANALYSIS

V(...V...)	I(...A...)
1.9	0.012
3.5	0.023
5.4	0.034
6.6	0.044
8.7	0.058

① توصيل الدارة كما في الشكل

$R = 150\ \Omega$

② تحديد مقدار V_{max}

$V_{max} = \sqrt{PR}$

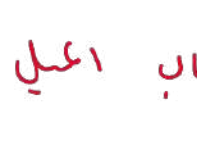
$V_{max} = \sqrt{5 \times 150} = 27$

يجب انه نتخطى هذا الرقم عند زيادة الجهد.

③ تغيير قيمة V ونقرأ (V) و (A)

وتسجيلها في الجدول ونكرر الخطوة مرة

④ نرسم الرسم البياني



وحساب الميل والمقاومة

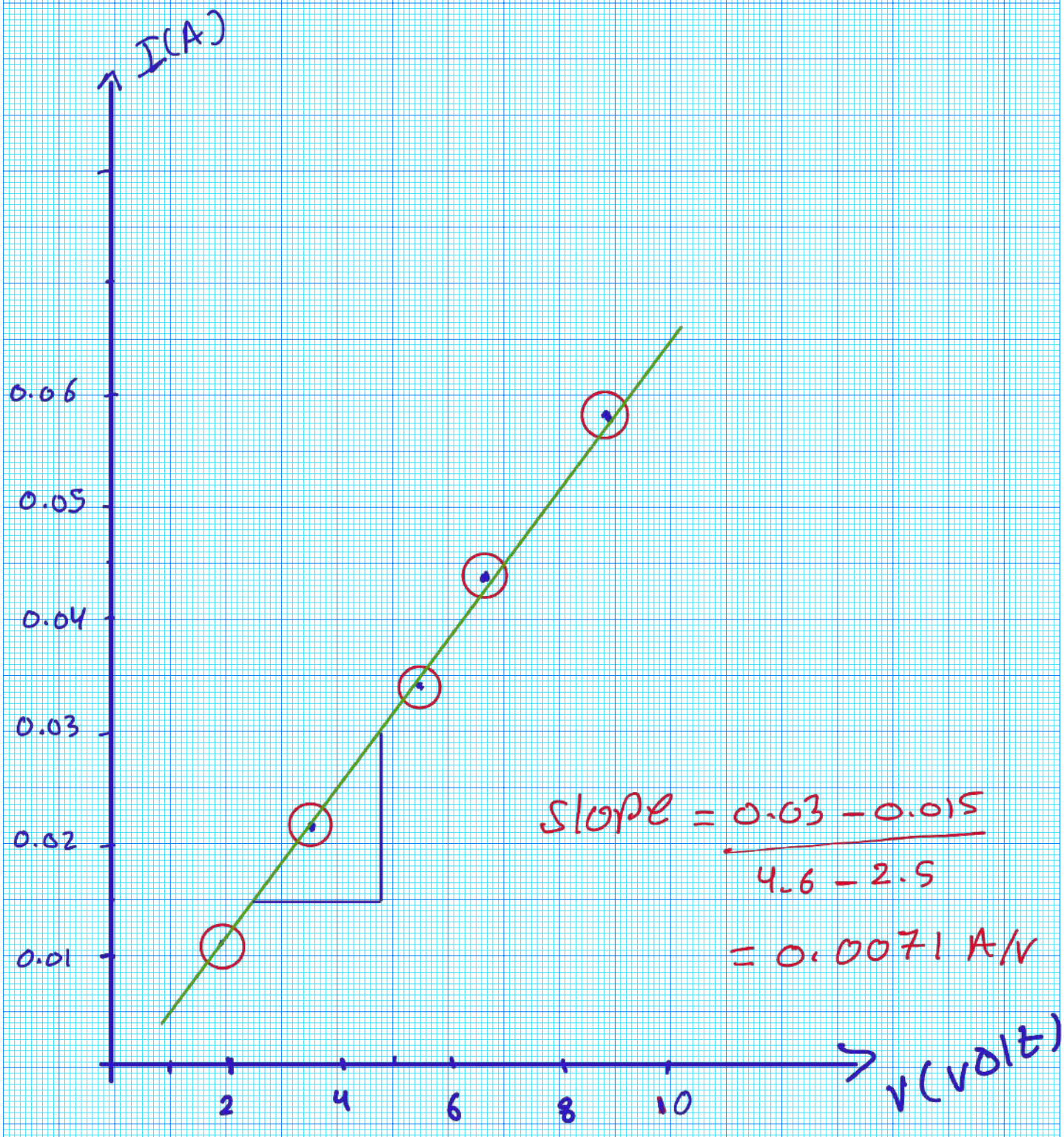
$$R = \frac{1}{\text{slope}} = \frac{1}{0.007} = 140\ \Omega$$

$$\text{Percentage error} = \left| \frac{R_{eca} - R_{exp}}{Real} \right| \times 100\%$$

$$= \frac{140-150}{150} \times 100\% = 6.67\%$$

4. **Conclusion**

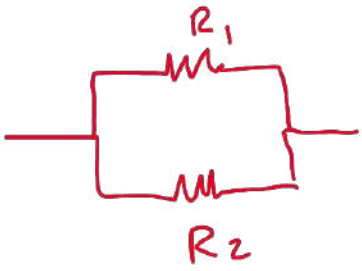
The experiment verified Ohm's Law, V=IR. Our measurements showed a consistent linear relationship between voltage and current, we get a very close resistance value when calculated using ohm's law compared to real one.

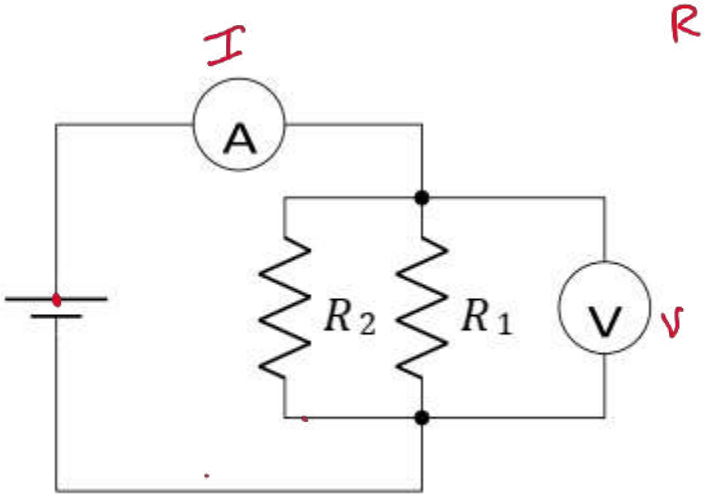


Experiment Title:

التوازي

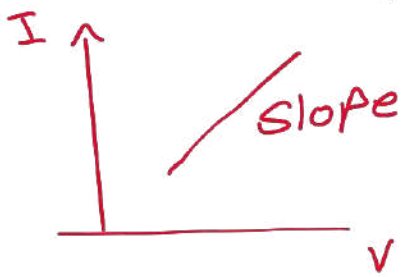
Resistors in Parallel





$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$$

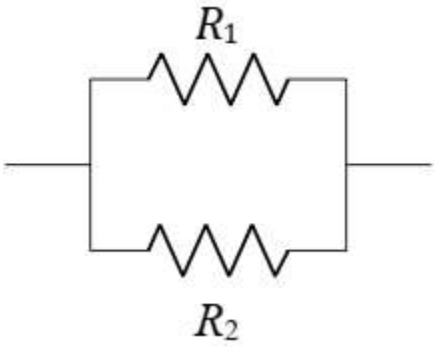


$$R_{eq} = \frac{1}{slope}$$

1. **OBJECTIVE**

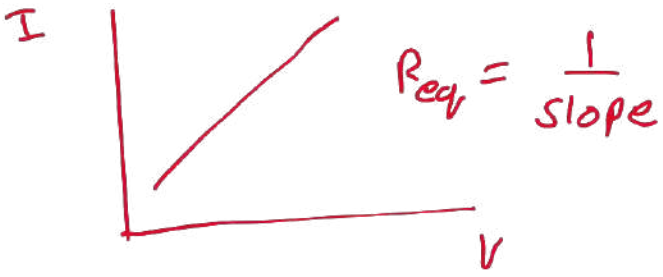
To calculate the equivalent resistance of two resistors in Parallel

2. **THEORY**



$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

$V = R_{eq} I$



EQUIPMENTS

DC power supply – Ammeter – Voltmeter – breadboard - resistors – connecting leads.

3. **ANALYSIS**

$R_1 = 100\,\Omega$ $R_2 = 150\,\Omega$

V (..V....)	I(..A...)
1.82	0.031
3.41	0.057
4.9	0.083
6.8	0.115
8.65	0.147

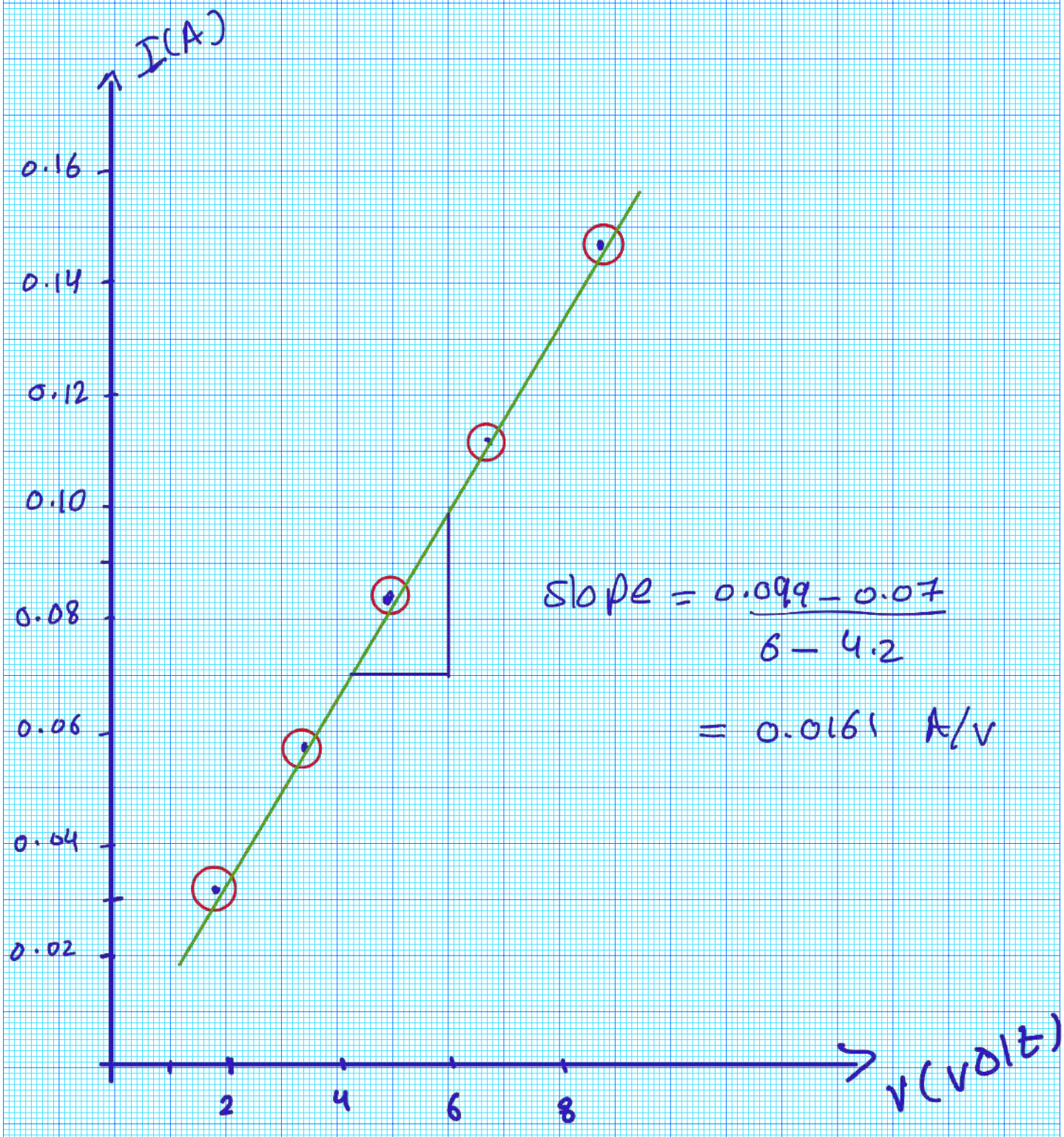
① حساب R_{eq} باستخدام القانون

$$R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$$

$$= \frac{100 \times 150}{100 + 150} = 60\,\Omega$$

② حساب Req من (عملي)

$$Req = \frac{1}{Slope} = \frac{1}{0.0161} = 62\ \Omega$$



$$Slope = \frac{0.099 - 0.07}{6 - 4.2}$$

$$= 0.0161\ A/V$$

$$\text{Percentage error} = \left| \frac{R_{eq\,exp} - R_{theor}}{R_{real}} \right| \times 100\%$$

$$= \left| \frac{60 - 62}{60} \right| \times 100\% = 3.3\%$$

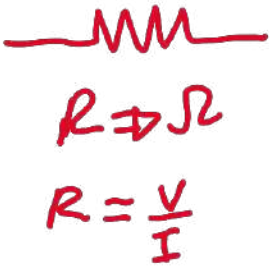
4. <u>Conclusion</u>

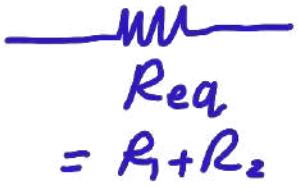
The experiment confirmed that the equivalent resistance of two resistors in parallel is less than the smallest individual resistor. Our measurements aligned with the theoretical formula 1/Req=1/R1+1/R2

Experiment Title:

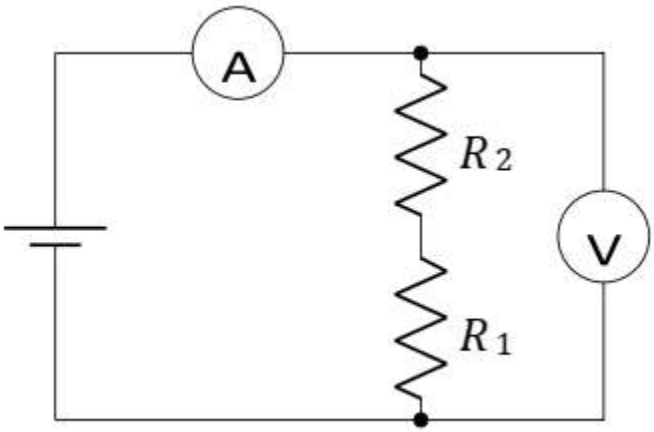
التوالي

Resistors in Series



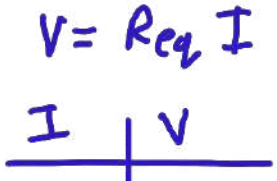


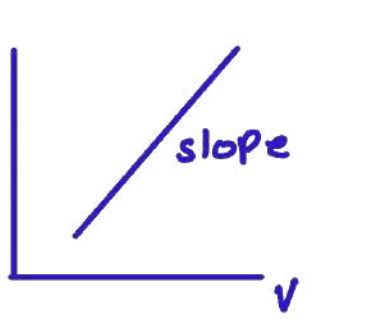
Student's Name



$$R_{eq} = R_1 + R_2$$

$$V = R_{eq} I$$





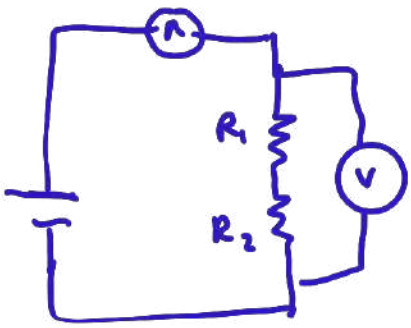
$$R_{eq} = \frac{1}{\text{slope}}$$

1. **OBJECTIVE**

To calculate the equivalent resistance of two resistors in series

2. **THEORY**

$$R = R_1 + R_2.$$



$V = R_{eq} I$

EQUIPMENTS

DC power supply – Ammeter – Voltmeter – breadboard - resistors – connecting leads. Instead of using ammeters and voltmeters. digital

.

- حوّصيل الدارة
- تغيير حتين لا واضه قراءه V , A كل مرة
- نفلا، الجدول

3. **ANALYSIS**

V (..V....)	I(..A...)
1.95	0.007
3.5	0.013
5.0	0.020
6.95	0.027
8.8	0.035


$R_1 = 100\,\Omega$


$R_2 = 150\,\Omega$

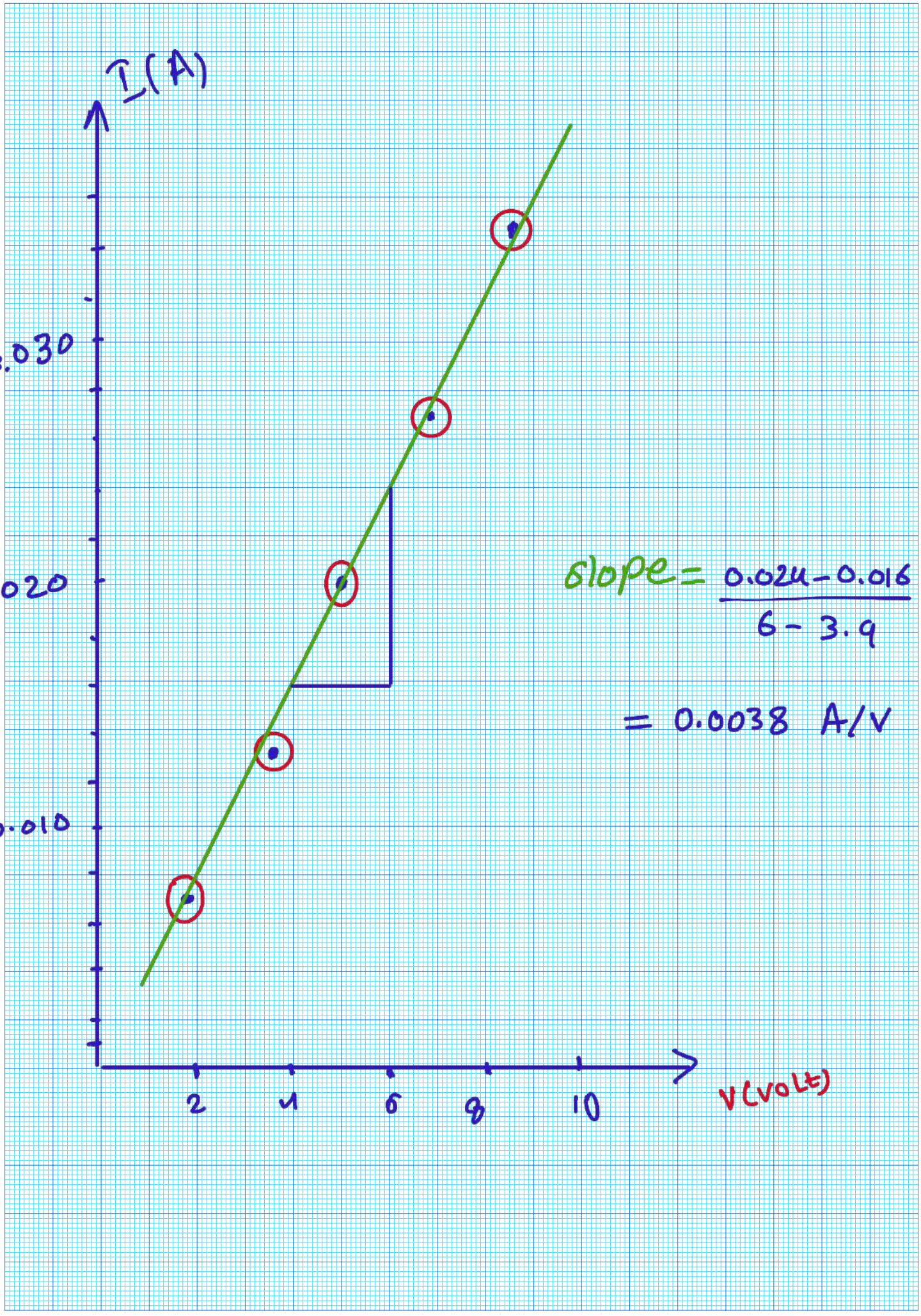
- نرسم المريم البياني

$Req = R_1 + R_2$

$= 100 + 150 = 250\,\Omega$

$Req = \frac{1}{slope} = 0.0038$

$= 263\,\Omega$



$$\text{Percentage error} = \frac{|R_{eq(exp)} - R_{eq(real)}|}{\text{Real}} \times 100\%$$

$$= \frac{263 - 250}{250} \times 100\% = 5.2\%$$

4. Conclusion

The experiment confirmed that the equivalent resistance of two resistors in series is the sum of their individual resistances. Our measurements aligned with the theoretical formula Req=R1+R2

Experiment Title:

FREE FALL

Student's Name

FREE FALL

الهدف هاب تارع السقوط الحر

$g = 9.8 m/s^2$

t_1 t_2 t_3

حنطوز

1. Suspend the steel ball using the holding magnet.
2. Position the photogate 65 cm from the holding magnet.
3. Release the ball by pressing START/STOP key of the stopclock.
4. Read the time and then reset the stopclock by pressing RESET key.
5. Repeat the measurement three times and record it in the below table.
6. Reduce the height and repeat the previous steps.

الارتفاع ÷100 — المعادة بتجربة ثلاث مرات — متوسط

Δy (cm)	Δy (m)	t_1 (s)	t_2 (s)	t_3 (s)	t_{avg} (s)	t_{avg}^2 (s^2)
25	0.25	1	2	3	$\frac{1+2+3}{3}=2$	$2^2=4$
35						
45						
55						
65						

1. **OBJECTIVE**

Determining the gravitational acceleration of a freely falling object.

2. **THEORY**

V_o: initial velocity (m/s)

Δy: hight (m)

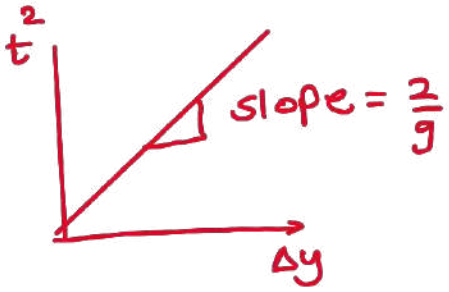
t: time (s)

g: acceleration of gravity

$\Delta y = V_o t + \frac{1}{2} g t^2$

$\Delta y = \frac{1}{2} g t^2$

$t^2 = \frac{2}{g} \Delta y$



$g = \frac{2}{slope}$

3. **EQUIPMENTS**

Steel ball – contact plate – holding magnet – holding magnet adapter with a release mechanism – photogate - electronic stop-clock – stand base – rods – measuring tape – connecting leads.

4. **ANALYSIS**

÷100

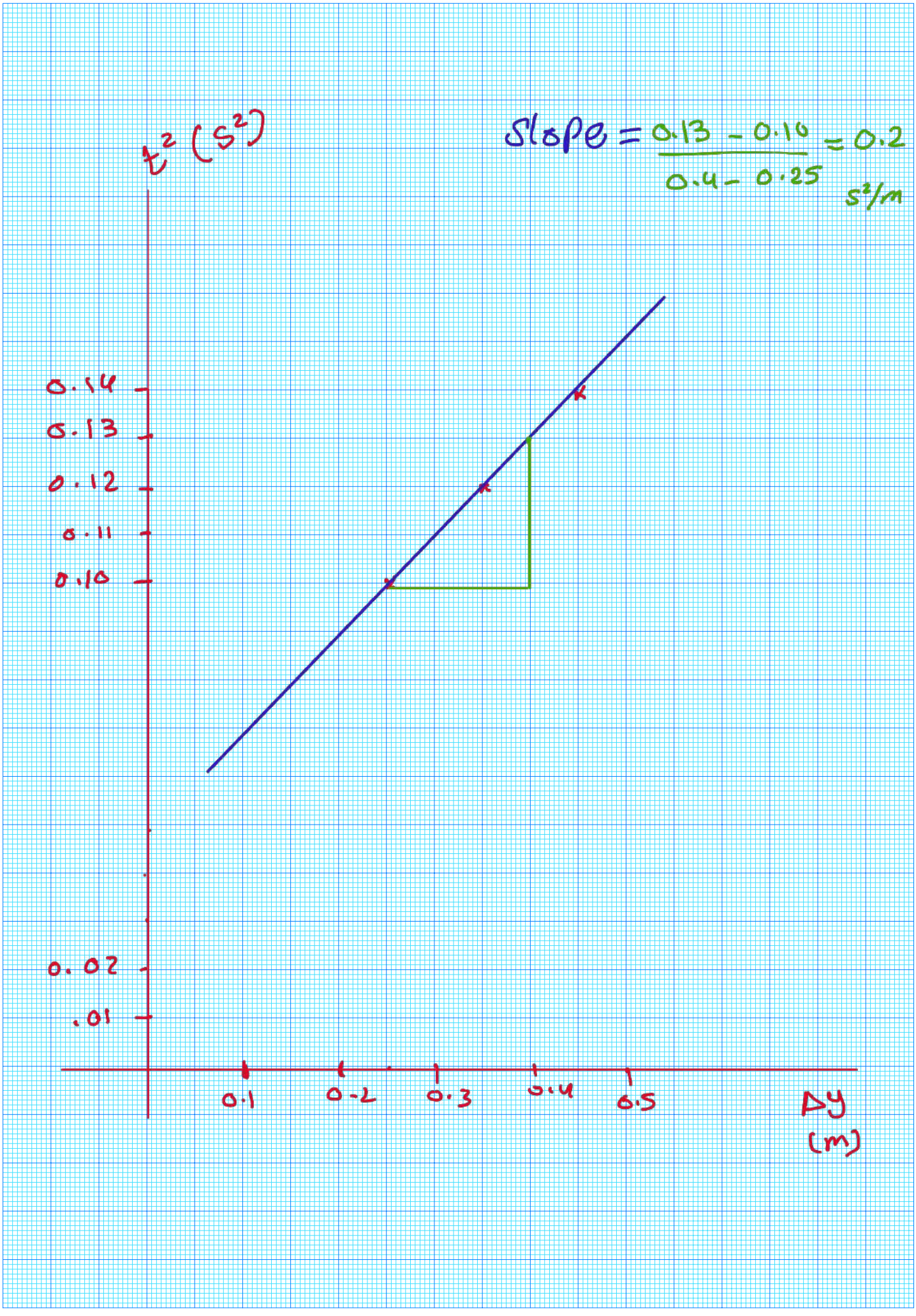
$\frac{t_1+t_2+t_3}{3}$

^{2} ج.ب

Δy (cm)	Δy (m)	t_1 (s)	t_2 (s)	t_3 (s)	t_{avg} (s)	$t_{avg}{}^2$ (s^2)
25	0.25	0.31	0.33	0.32	0.32	0.102
35	0.35	0.34	0.35	0.35	0.346	0.120
45	0.45	0.36	0.38	0.37	0.373	0.139
55						
65						

* $g = \frac{2}{slope} = \frac{2}{0.2} = 10\ m/s^2$

* Percentage error $= \left|\frac{\text{القيمة الحقيقية} - \text{القيمة المحسوبة}}{\text{القيمة الحقيقية}}\right| = \frac{|g_{real} - g_{exp}|}{g_{real}} = \left|\frac{9.8-10}{9.8}\right| \times 100\% = 2\%$

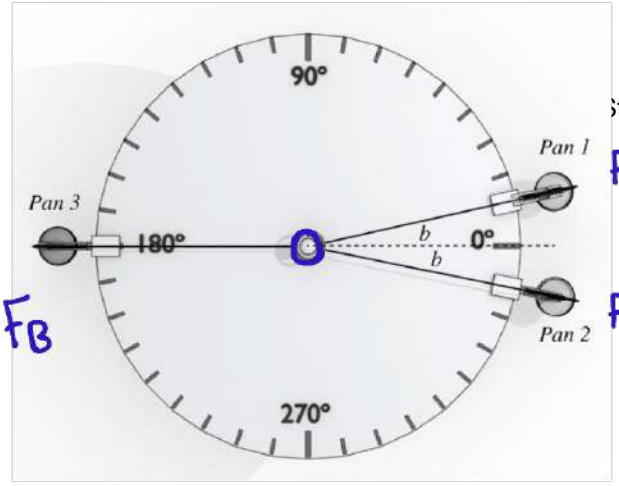


5. **Conclusion**

This experiment demonstrates that the gravitational field strength remains constant during free fall. The height from which an object is dropped and the time of fall do not affect its acceleration. By comparing the obtained acceleration values with the constant value, we are able to account for the experimental errors. We can therefore conclude that the acceleration due to gravity is 9.8m/s2.

Experiment Title:

Force Table



Student's Name

F_1

F_2

F_B

m_B m_2 m_1

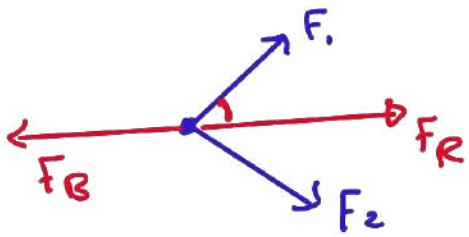
θ_B θ_2 θ_1

1. **OBJECTIVE**

1. Determining the sum or the resultant force of two forces using the Force Table.
2. Comparing the results obtained experimentally with that calculated by theoretical methods of adding vectors.

2. **THEORY**

Experimental



$F_R = F_B - 180$

$|F_R| = |F_B|$

Theoritical

$F_1 \nearrow \quad F_{1x} = F_1 \cos\theta_1$

$\searrow \quad F_{1y} = F_1 \sin\theta$

$F_2 \nearrow \quad F_{2x} = F_2 \cos\theta_2$

$\searrow \quad F_{2y} = F_2 \sin\theta_2$

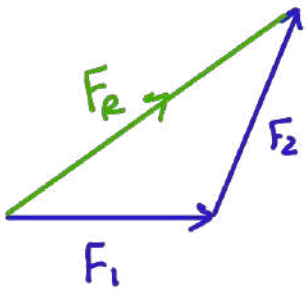
$F_x = F_{1x} + F_{2x}$

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

$F_R = \sqrt{F_x^2 + F_y^2}$

$\theta = \tan^{-1}\left(\frac{F_y}{F_x}\right)$

Graphical



$F_R =$ ____

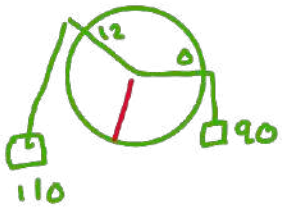
$\theta =$ ____

EQUIPMENTS

- Force table
- Stand base
- Pulleys
- Hangers
- Slotted masses
- Strings
- Center ring
- Protractor .

3. **ANALYSIS**

A-Experimental method



	First Force	Second Force	Balancing Force
m (g)	90	110	110
m (kg)	0.09	0.11	0.11
F (N)	0.882	1.078	1.078
θ (°)	0	120	245

÷1000

m×g
m×9.8

* the resultant force

$F_R = -F_B$ $\quad \theta = 245 - 180$

$F_R = 1.078\,N$ $\quad = 65^\circ$

* $F_{1x} = F_1 \cos\theta = F_1 \cos 0 = 0.882$

$F_{1y} = F_1 \sin\theta = F_1 \sin 0 = 0$

$F_{2x} = F_2 \cos 120 = 1.078 \times \cos 120 = -0.539$

$F_{2y} = F_2 \sin 120 = 1.078 \times \sin 120 = 0.934$

$F_x = F_{1x} + F_{2x}$ $\quad = 0.882 - 0.539 = 0.343$

$F_y = F_{1y} + F_{2y}$ $\quad = 0.934$

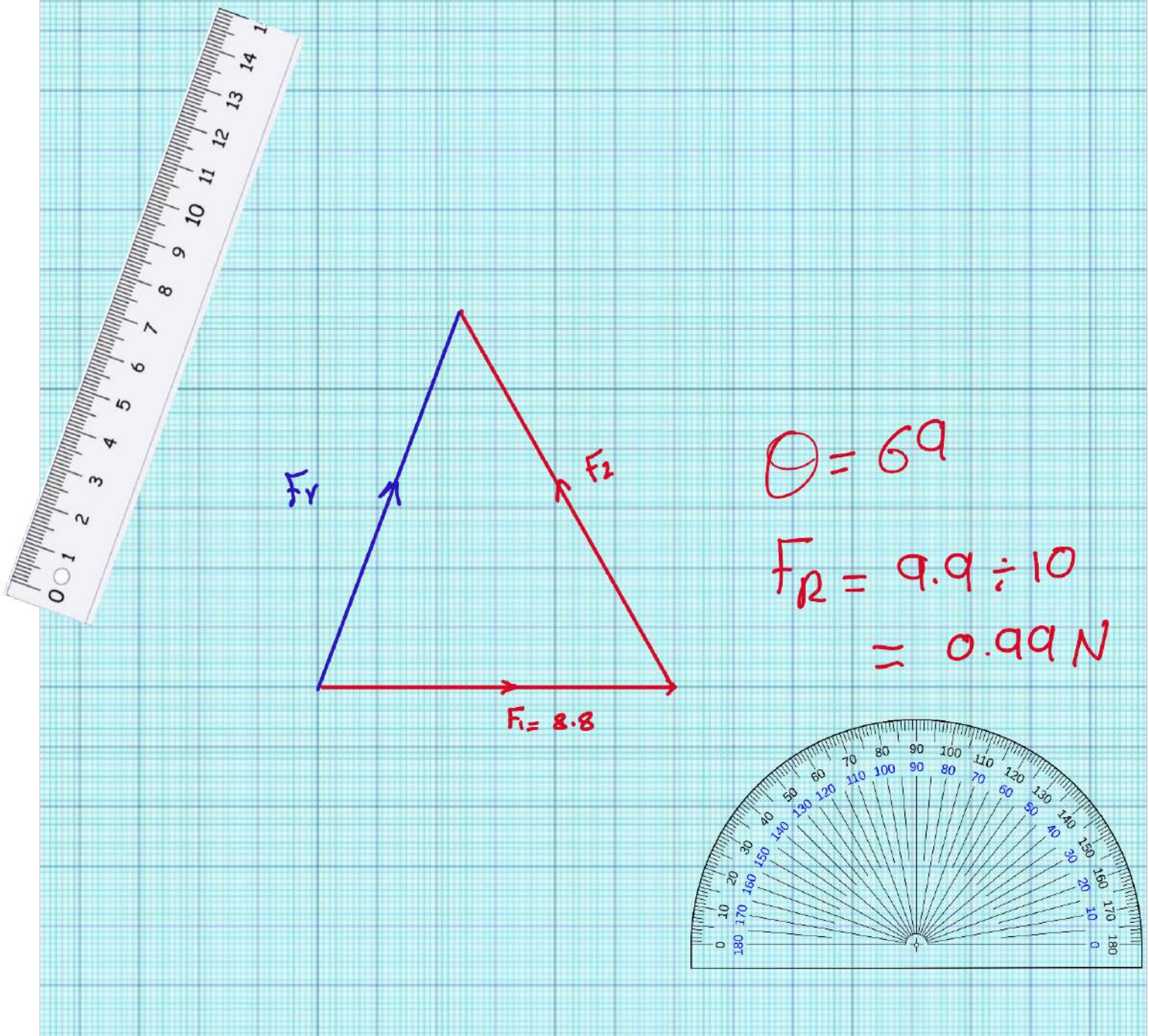
$F_R = \sqrt{0.343^2 + 0.934^2} = 0.99N$ $\theta = \tan^{-1}\left(\frac{0.934}{0.343}\right) = 69^0$

B-Graphical method

First Force	Second Force
0.882	1.078
0	120

scale x10

F_1	F_2
8.8	10.8
0	120



4. Conclusion

This experiment verified that the vector sum of two forces can be accurately represented by a single resultant force measured experimentally in both magnitude and direction.

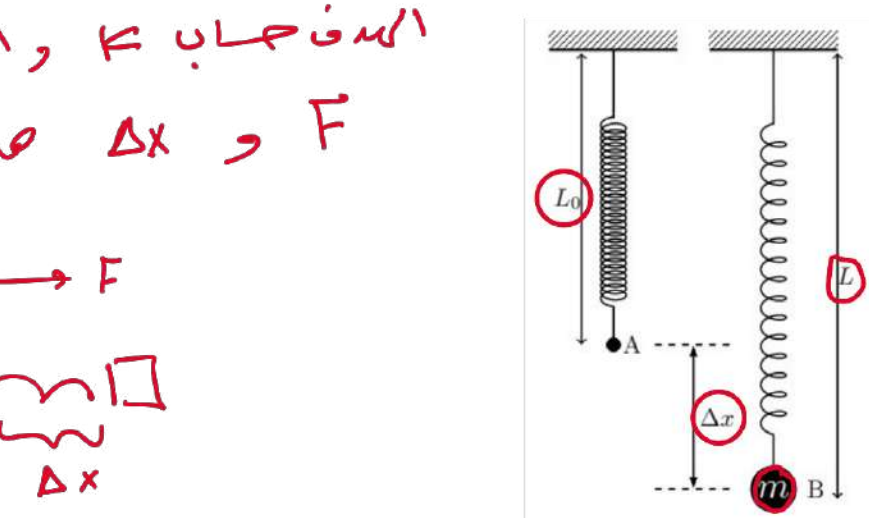
Experiment Title:

Hooke’s law

Student’s Name

الهدف من التجربة هو التأكد من العلاقة بين F و Δx هي علاقة خطية طردية

$F = K \Delta x$



1. **OBJECTIVE**

Determining the spring constant (k) by using Hooke's law.

2. **THEORY**

$F_s \propto -\Delta x$

$F = k\Delta x$ --- Hooke's

$k = \frac{F}{\Delta x}$

$slope = \frac{1}{k}$

$k = \frac{1}{slope}$

3. **EQUIPMENTS**

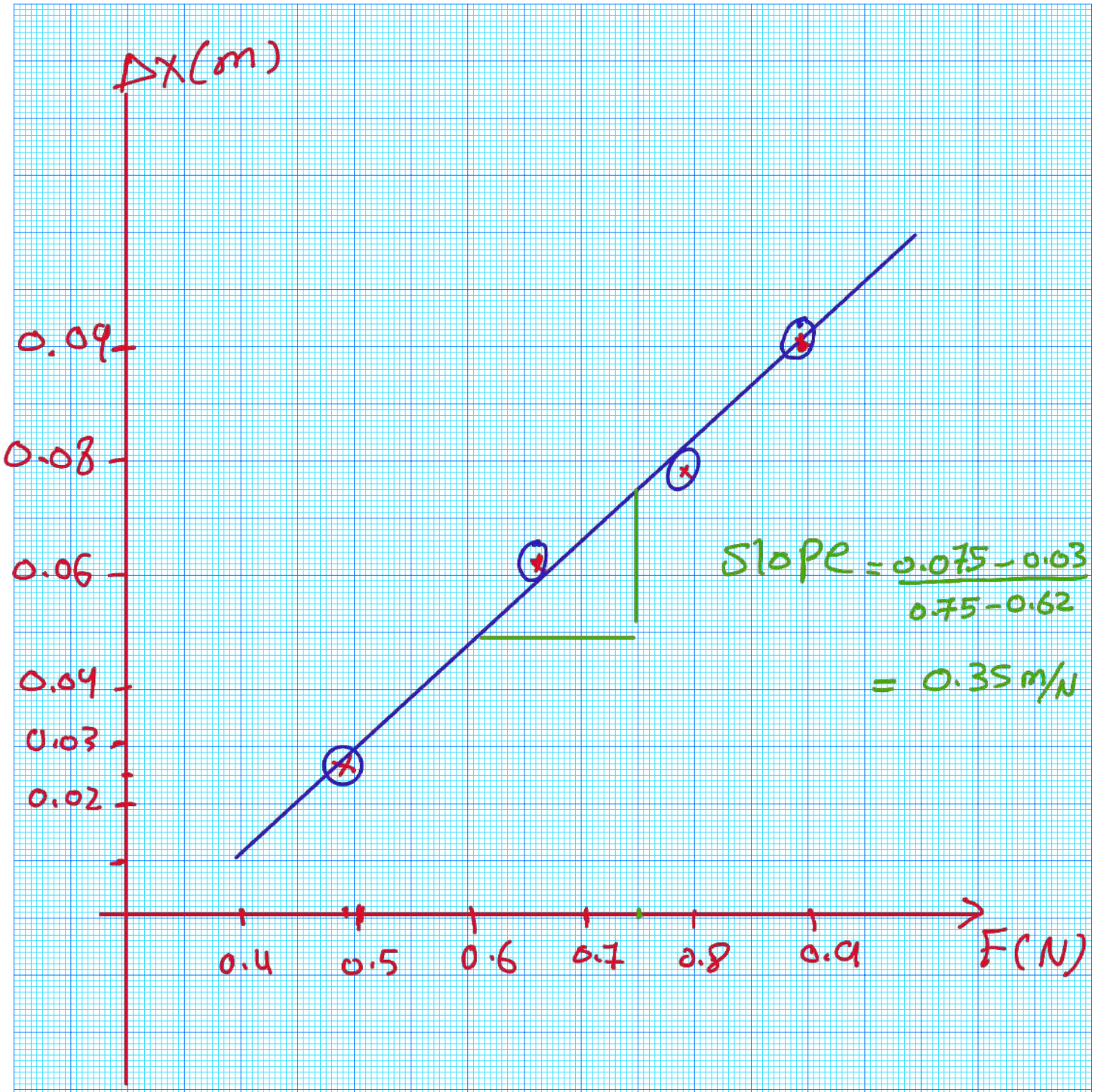
• Scale. • Clamp. • Base. • Spring. • Masses.

$L_o = 8.5$ cm

4. **ANALYSIS**

كتلة ÷1000 — الطول الكلي — الازاحة ÷100 — القوة

m (g)	m (kg)	L (cm)	Δx (cm)	Δx (m)	F (N) $= mg$
50	0.05	11	$\frac{L - L_o}{2.5}$	0.025	$0.05 \times 9.8 = 0.49$
70					
90	0.09	13.5	5	0.05	$0.09 \times 9.8 = 0.882$
110					
130					



slope = 0.35 m/N

$$k = \frac{1}{\text{slope}} = \frac{1}{0.35} = 2.85 \text{ N/m}$$

5. Conclusion

There is linear proportionality between the applied force to a spring and it's extension which confirms Hooke's law

$F=kx$