VI-1:

Number (#)	L (cm)
1	176.0
2	177.5
3	161.0
4	159.0
5	160.9
6	162.4
7	175.0
8	174.0
9	174.0
10	175.0

Calculation of mean & standard deviation can be done using excel

For the first 3 measurements:
-Average value of L: 171.5cm
-Standard deviation of L: 9.124144cm
-Standard deviation of the mean of L: 5.267826995cm

Calculation of standard deviation of the mean:

$$\sigma_{\bar{x}} = \frac{\sigma_x}{\sqrt{N}} = \frac{9.124144}{\sqrt{3}} = 5.267826995\,cm$$

For the first 5 measurements:
-Average value of L: 166.88cm
-Standard deviation of L: 9.060739484cm
-Standard deviation of the mean of L: 4.052085666cm

For all 10 measurements:

-Average value of L: 169.48cm
-Standard deviation of L: 7.558042075cm
-Standard deviation of the mean of L: 2.390062737cm

$L \pm \sigma_L = 169 \pm 2$
As more measurements were taken, standard deviation got smaller, which means there is less variability from the mean as more measurements are taken.

VI-2:

Minimum graduation on ammeter	1.0 mA
Minimum graduation on voltmeter	0.5 V
Parallax reading of current	29 mA
Parallax reading of voltage	5 V
Measured Current	30 mA
Measured voltage	4.5 V
R using DVM	147.8 ohms

Calculation of uncertainty of current (σ_I):

$$\sigma_I = \sqrt{(\sigma_I due¿ parallax)^2 + (\sigma_I due¿meter\ graduations)^2}$$

$$\sigma_I due¿ parallax = Actual\,value - parallax\,value = ¿$$ 30 – 29 = 1mA

$\sigma_I due¿ parallax$ = 0.5 x smallest graduation = 0.5 x 1 = 0.5mA

Therefore,

$$\sigma_I = \sqrt{(1)^2 + (0.5)^2} = 1.118033989\,mA$$

Same calculation is applied to the uncertainty of voltage

$$\sigma_V = 0.5590169944\,V$$

Using equation R = V/I:
V= 4.5 volts, I= 30 mA
R= (4.5 volts)/ (30 mA)= 0.150 volts/ mA = 150Ω

With the equation C=$\frac{A}{B}$,

$$\frac{\sigma_C}{C}=\sqrt{\left(\frac{\sigma_A}{A}\right)^2+\left(\frac{\sigma_B}{B}\right)^2}$$

Thus, with the equation R=$\frac{V}{I}$,

$$\frac{\sigma_R}{R}=\sqrt{\left(\frac{\sigma_V}{V}\right)^2+\left(\frac{\sigma_I}{I}\right)^2}$$

$$\sigma_R=R\sqrt{\left(\frac{\sigma_V}{V}\right)^2+\left(\frac{\sigma_I}{I}\right)^2}=¿(150)\sqrt{\left(\frac{1.118033989}{4.5}\right)^2+\left(\frac{0.5590169944}{30}\right)^2}=37.3724683\,\Omega$$

R ± σ_R = 150 ± 40 Ω

The calculated value of R does agree with the measured value of the resistance 147.8Ω.