SLR.8

Monday 13th November 2017

3-5pm

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The Pendulum

(Statistical Analysis)

Learning Objectives:

After recording the length of the pendulum and created a set of data, I shall calculate the standard deviation for period (T), using said value, I will calculate the value of (g) with its associated error. From the set of data, I will plot a frequency distribution function.

Equipment:

- Metre rule
- Mounted protractor
- Pendulum Bob & thread
- Stopwatch
- G-clamp
- Retort stand & pendulum clamp

Data collected:

- Displacement angle
- Length of pendulum
- Standard error
- Value of (T)
- Value of (g)
- Max/Min of data values

Risk Assessment:

The PC is connected to mains electricity, which has the potenial to electrocute me and others, this is controlled by a visible PAT (portable appliance Test) sticker to confirm its safe to use. I will be using a stool, which I could fall offs of and hurt mysely & others around me. If stationary for too long, I could fall victim to skeltal & joint pain, I can control this by not staying stationary for too long. The equipment that I shall be using will be heavy and have sharp edges, thus they may fall offs of the table which could injure my feet or others around me, I can control this by keeping all the equipment away from the edge of the table.

Task 1,

Length (L in cm)	95.5 cm	95.6 cm	95.5 cm	95.4 cm	95.4 cm
Mean value ($\bar{L}$)	95.48 cm				
Standard Error (S_N)	0.0375 cm				
Result (L) in Standard form	95.48 ± 0.0375 cm				

Mean value; $\frac{(95.5 + 95.6 + 95.5 + 95.4 + 95.4)}{5} = 95.48\text{cm}$

Standard Error;

$$\sigma_N = \sqrt{\frac{(95.5 - 95.48)^2 + (95.6 - 95.48)^2 + (95.5 - 95.48)^2 + (95.4 - 95.48)^2 + (95.4 - 95.48)^2}{5}}$$

$\sigma_N = 0.075\text{cm}$

$S_N = \frac{0.075}{\sqrt{5-1}} = 0.0375\text{ cm}$

Task 2,

1.18	1.94	1.78	1.72	1.99	1.96	1.94	1.94	1.87	2.03
1.57	1.96	1.97	1.97	1.94	1.97	1.97	1.96	1.94	1.97
2.13	1.91	1.91	2.06	1.97	1.84	191	2.00	1.94	1.81
2.03	1.94	1.85	1.91	1.92	1.97	1.87	1.87	2.03	1.91
1.91	1.81	1.93	1.75	1.97	2.00	2.00	1.97	1.97	1.88
1.81	1.88	1.91	1.84	1.97	1.81	1.84	1.91	1.94	1.88
1.97	1.88	1.78	1.88	1.87	1.97	1.78	1.85	1.88	1.91
2.00	1.91	1.87	1.96	2.00	1.88	1.81	1.84	1.88	1.88
1.93	1.94	2.03	1.81	1.78	2.00	1.94	1.91	1.94	2.06
1.91	2.13	2.02	1.96	1.92	2.04	2.06	1.87	1.97	1.98

Table 2: Set of data (in seconds)

Task 3,

(3)

Mean Value:

All of data added up = 191.36s

$$\bar{T} = \frac{191.36}{100} = 1.9136_s$$

Standard Error:

$$\sigma_N = \sqrt{\frac{\sum(x_i - \bar{x})^2}{N}} = \sqrt{\frac{1.53553804}{100}} = 0.124_s$$

$$S_N = \frac{0.124}{\sqrt{100-1}} = 0.0125_s$$

Result (T) in standard form = $1.9136_s \pm 0.0125_s$

Value of (g) in standard form =

$$T = 2\pi\sqrt{\frac{L}{g}} \Rightarrow g = \frac{4\pi^2 L}{T^2} = \frac{4\pi^2 95.48}{1.9136^2} = 1029.37_{s^2}$$

Task 4,

Maximum value = 1.12s

Minimum value = 2.13s

Number of bins = 0.05s