**Statistics Assignment 1**

**Question 1: Plot a Histogram**

To plot a histogram, follow these steps using your data:

1. **Data**: 10, 13, 18, 22, 27, 32, 38, 40, 45, 51, 56, 57, 88, 90, 92, 94, 99
2. **Bins**: You need to determine the bin intervals. For example, you might choose bins of size 10.
3. **Plot**: Using a tool like Excel or Python's Matplotlib:

**Python Example**:

python

Copy code

import matplotlib.pyplot as plt

data = [10, 13, 18, 22, 27, 32, 38, 40, 45, 51, 56, 57, 88, 90, 92, 94, 99]

plt.hist(data, bins=range(10, 101, 10), edgecolor='black')

plt.xlabel('Value')

plt.ylabel('Frequency')

plt.title('Histogram')

plt.show()

**Excel**:

* + Enter your data in a column.
  + Select the data and go to Insert > Histogram.

**Question 2: 80% Confidence Interval (CI)**

* **Population Standard Deviation (σ)**: 100
* **Sample Mean (M)**: 520
* **Sample Size (n)**: 25

The formula for the confidence interval is: CI=M±Z×σn\text{CI} = M \pm Z \times \frac{\sigma}{\sqrt{n}}CI=M±Z×n​σ​

For an 80% CI, the Z-value (from Z-tables) is approximately 1.28.

CI=520±1.28×10025\text{CI} = 520 \pm 1.28 \times \frac{100}{\sqrt{25}}CI=520±1.28×25​100​ CI=520±1.28×20\text{CI} = 520 \pm 1.28 \times 20CI=520±1.28×20 CI=520±25.6\text{CI} = 520 \pm 25.6CI=520±25.6 CI=(494.4,545.6)\text{CI} = (494.4, 545.6)CI=(494.4,545.6)

**Question 3: Hypothesis Testing**

* **Null Hypothesis (H₀)**: p≤0.60p \leq 0.60p≤0.60 (The proportion of vehicle owners is 60% or less)
* **Alternative Hypothesis (H₁)**: p>0.60p > 0.60p>0.60 (The proportion of vehicle owners is greater than 60%)

**Sample Data**:

* Sample Size (n): 250
* Number of Yes responses (x): 170
* Sample Proportion (p^\hat{p}p^​): 170250=0.68\frac{170}{250} = 0.68250170​=0.68

**Test Statistic**: z=p^−p0p0(1−p0)nz = \frac{\hat{p} - p\_0}{\sqrt{\frac{p\_0 (1 - p\_0)}{n}}}z=np0​(1−p0​)​​p^​−p0​​ z=0.68−0.600.60×0.40250z = \frac{0.68 - 0.60}{\sqrt{\frac{0.60 \times 0.40}{250}}}z=2500.60×0.40​​0.68−0.60​ z=0.080.00096z = \frac{0.08}{\sqrt{0.00096}}z=0.00096​0.08​ z=0.080.03098≈2.58z = \frac{0.08}{0.03098} \approx 2.58z=0.030980.08​≈2.58

**Critical Value for 10% Significance Level**: Approximately 1.28.

**Decision**: Since the calculated z-value (2.58) is greater than the critical value (1.28), there is enough evidence to reject the null hypothesis. The data suggests the proportion of vehicle owners is more than 60%.

**Question 4: 99th Percentile**

**Data**: 2,2,3,4,5,5,5,6,7,8,8,8,8,8,9,9,10,11,11,12

To find the 99th percentile:

1. **Order the Data**: Already ordered.
2. **Calculate the Index**: Index=99100×(N+1)\text{Index} = \frac{99}{100} \times (N + 1)Index=10099​×(N+1) Index=99100×21=20.79\text{Index} = \frac{99}{100} \times 21 = 20.79Index=10099​×21=20.79

The 99th percentile value is between the 20th and 21st values.

**Value**: The 20th value is 12, and the 21st value is not present in this dataset, so it’s the maximum value present.

Hence, the 99th percentile is 12.

**Question 5: Mean, Median, and Mode in Skewed Data**

* **Left-Skewed (Negative Skew)**:
  + **Order**: Mode > Median > Mean
  + **Graph**: The tail is longer on the left side.
* **Right-Skewed (Positive Skew)**:
  + **Order**: Mean > Median > Mode
  + **Graph**: The tail is longer on the right side.

**Graphs**:

* **Left-Skewed**:
* **Right-Skewed**: