

Definitions:

1. Be able to classify variables as either
 - (a) Population vs. Sample
 - (b) Quantitative vs. Qualitative
 - (c) Discrete vs. Continuous
2. Be able to take raw data and make a frequency distribution table and a histogram

Ex : The ages of 20 children are given as followed:

7 4 5 6 7 5 7 4 6 3
9 7 7 5 4 7 4 3 3 8

- (a) Create a frequency distribution table
 - (b) Create a histogram for the data
3. Finding mean, median and mode for ungrouped data

(a) Mean and Variance for Population data :

$$\mu = \frac{\Sigma x}{N} \quad \sigma^2 = \frac{\Sigma x^2 - \frac{1}{N} (\Sigma x)^2}{N}$$

(b) Mean and Variance for Sample data :

$$\bar{x} = \frac{\Sigma x}{n} \quad s^2 = \frac{\Sigma x^2 - \frac{1}{n} (\Sigma x)^2}{n - 1}$$

4. Finding mean and standard deviation for grouped data.

| Commuting Time (in minutes) | f | m | mf | m^2f |
|-----------------------------|-----|-----|------|--------|
| 0 to less than 10 | 3 | | | |
| 10 to less than 20 | 5 | | | |
| 20 to less than 30 | 8 | | | |
| 30 to less than 40 | 11 | | | |
| 40 to less than 50 | 7 | | | |

5. Stem and Leaf displays. Given raw data, make a stem and leaf display. Also, given a stem and leaf display, find the raw data.

Example : Create a stem and leaf display for the following data:

17 43 53 26 34 35 27 42 26 33
 19 47 27 25 41 37 14 32 33 18

Example : The following is a stem and leaf display. Write the data set that is represented by the display

| | | | | | | | | |
|-----|---|---|---|---|---|---|---|---|
| 0-2 | 3 | 3 | 4 | 5 | * | 2 | 3 | * |
| 3-5 | * | 2 | 4 | 6 | * | 2 | | |
| 6-8 | 1 | 4 | * | * | 2 | | | |

6. Chebyshev's Theorem and Empirical Rule

(a) Chebyshev's Theorem : For any $k \geq 1$, at least

$$1 - \frac{1}{k^2}$$

of the values are within k standard deviations of the mean.

(b) Empirical Rule : For a data set with a *bell-shaped distribution*

- Approximately 68 percent of the data lie within 1 standard deviation of the mean.
- Approximately 95 percent of the data lie within 2 standard deviations of the mean.
- Approximately 99.7 percent of the data lie within 3 standard deviations of the mean.

7. Probability : Experiments, Outcomes, Sample Spaces, Conditional Probability, Intersections and Unions of Events

Example :

| | | | |
|-----------|---|-----------|-------|
| | A | \bar{A} | Total |
| B | 3 | 4 | |
| \bar{B} | 6 | 8 | |
| Total | | | |

- (a) Find $P(A), P(B), P(\bar{B}), P(A \cap \bar{B}), P(A | B), P(\bar{A} | B), P(A \cup B)$.
- (b) Are the events A and B independent?
- (c) Are the events A and B mutually exclusive?

Example : Toss a coin three times. Let A be the event that there was at least one head, and let B be the event there was exactly one tail.

- (a) Find the sample space for this experiment.

- (b) Find $P(A)$.
- (c) Find $P(B)$.
- (d) Find $P(A \cap B)$.
- (e) Find $P(A \cup B)$.

Example : It is known that 75 percent of the population has mad cow disease. An experiment consists of selecting two members of the population and noting whether or not they have mad cow.

- (a) Find the probability exactly one selected member has mad cow.
- (b) Find the probability both selected members have mad cow.

8. Probability Distribution Functions of a Discrete Random Variable

Example. In the previous experiment, let x be the discrete random variable that counts the number of people that we selected who have mad cow disease. Find the probability density function for this random variable x . Find the mean and standard deviation for this probability density.