Measures of Center and Dispersion

- **Measures of Center**

  1. Mean $(\mu, \bar{x})$ - average (equal to the sum of the values divided by the number of values).

  a. Population mean, $\mu = \frac{1}{N}\sum_{i=1}^{N} X_i$, where N is the population size.

  b. Sample mean, $\bar{X} = \frac{1}{n}\sum_{i=1}^{n} X_i$, where n is the sample size.

  Example 1: Consider a random sample of 11 monthly salaries (in thousands of dollars):

  $$\{2.5, 3.2, 3.2, 3.4, 3.6, 3.9, 3.9, 3.9, 4, 4.2, 4.2\}$$

  Find the sample mean.

  Practice 1: Consider the random sample of 21 length of stay in a hospital (in days):

  $$\{1, 1, 2, 3, 4, 5, 5, 6, 6, 7, 9, 9, 9, 10, 12, 13, 13, 15, 18, 24, 28\}$$

  Determine the sample mean.

  2. Median $(\tilde{\mu}, \tilde{x})$ - middle value (when values are arrangement from lowest to highest). If there are an odd number of values, there will be one value right in the middle. If there are an even number of values, then the median is the average of the middle pair.

  Example 2: Using the random sample of 11 monthly salaries, find the sample median.

  Practice 2: Using the random sample of 21 lengths of stay, find the sample median.

  3. Mode - most frequent occurring value.

  Example 3: Using the random sample of 11 monthly salaries, determine the mode.

  Practice 3: Using the random sample of 21 lengths of stay, determine the sample mode.

- Consider the following data sets:

  1. $S_1 = \{1, 2, 5, 5, 8, 9\}$

  2. $S_2 = \{3, 4, 5, 5, 6, 7\}$

  3. $S_3 = \{5, 5, 5, 5, 5, 5\}$

- **Measures of Dispersion (Spread)**

  1. Range = Maximum value - Minimum value

  2. Variance

  a. Population variance, $\sigma^2 = \frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2$

  b. Sample variance, $S^2 = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2$

Computing formula: $S^2 = \frac{1}{n-1}\left(\sum_{i=1}^{n} x_i^2 - \frac{1}{n}(\sum_{i=1}^{n} x_i)^2\right)$

  3. Standard Deviation = $\sqrt{\text{Variance}}$

  a. S_1:

  b. S_2:

  c. S_3:

Homework.

Section 2.4: (pp. 63 - 67) # 2.48, 2.51, 2.53, 2.55, 2.56, 2.57, 2.61, 2.64(omit d).
Section 2.5: (pp. 71 - 72) # 2.72, 2.74, 2.75, 2.79.