Chapter 3.1 Measures of Central Tendency

Objective A: Mean, Median and Mode

Three measures of central tendency: the ________, the ________, and the ________.

A1. Mean

The ________, of a variable is the sum of all data values divided by the number of observations.

______, mean:   \[ \mu = \frac{\sum x_i}{N} \] where \( x_i \) is each data value and ___ is the population size (the number of observations in the ________).

______, mean:   \[ \bar{x} = \frac{\sum x_i}{n} \] where \( x_i \) is each data value and ___ in the sample size (the number of observations in the ________).

Example 1: Population: 12 16 23 17 32 27 14 16

Compute the population mean and sample mean from a simple random sample of size 4. Does the sample mean equal to the population mean? Does the population mean or sample mean stay the same? Explain.

(a) Population mean: (Round the mean to _____ more decimal place than that in the raw data)

(b) Sample mean:

Randomly, ______________________ were selected.

(c) Does the sample mean equal to the population mean?

(d) Does the population mean or sample mean stay the same? Explain.
A2. Median
The ________, M, is the value that lies in the middle of the data when arranged in __________ order.

If \( n \) is _____, the median is the data value in the ________ of the data set; the location of the median is the \( \frac{n+1}{2} \) position.

If \( n \) is ______, the median is the mean of the two middle observations in the data set that lie in the \( \frac{n}{2} \) and \( \frac{n}{2} + 1 \) position respectively.

Example 1: Find the median of the data given below.
\[
4 \quad 12 \quad 32 \quad 24 \quad 9 \quad 18 \quad 28 \quad 10 \quad 36
\]

Example 2: Find the median of the data given below.
\[
\$35.34 \quad \$42.09 \quad \$38.72 \quad \$43.28 \quad \$39.45 \quad \$49.36 \quad \$30.15 \quad \$40.88
\]

A3. Mode
__________ is the most frequent observation in the data set.

Example 1: Find the mode of the data given below.
\[
76 \quad 60 \quad 81 \quad 72 \quad 60 \quad 80 \quad 68 \quad 73 \quad 80 \quad 67
\]

Example 2: Find the mode of the data given below.
\[
A \quad C \quad D \quad C \quad B \quad C \quad A \quad B \quad B \quad F \quad B \quad W \quad F \quad D \quad B \quad W \quad D \quad A \quad D \quad C \quad D
\]
Example 3: The following data represent the G.P.A. of 12 students.

2.56 3.21 3.88 2.44 1.96 2.85 2.32 3.38 1.86 3.04 2.75 2.23

Find the mean, median, and mode G.P.A.

**Objective B : Relation Between the Mean, Median and Distribution Shape**

- The _________ is sensitive to _________ data. For continuous data, if the distribution shape is a bell-shaped curve, the mean is a better measure of central tendency because it includes all data values in a data set.

- The _________ is resistant to _________ data. For continuous data, if the distribution shape is skewed to the _________ or _________, the median is a better measure of central tendency.

- The _________ is used to represent the measure of central tendency for _________ data.

**Mean or Median versus Skewness**

<table>
<thead>
<tr>
<th>Distribution Shape</th>
<th>Mean versus Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skewed left</td>
<td>Mean substantially smaller than median</td>
</tr>
<tr>
<td>Symmetric</td>
<td>Mean roughly equal to median</td>
</tr>
<tr>
<td>Skewed right</td>
<td>Mean substantially larger than median</td>
</tr>
</tbody>
</table>

(a) Skewed Left
Mean < Median

(b) Symmetric
Mean = Median

(c) Skewed Right
Mean > Median