Computer Oriented Statistical Methods

Assignment - 1 Central Tendency

Q1 Consider the numbers 2, 3, 4, 5, 5

(a) Compute the mode, median and mean

→ (i) **Mode**: value that occures with greatest frequency.

Mode = 5

(ii) **Median**: (for odd nos) $\left(\frac{n+1}{2}\right)^{th}$ term.

Median = $\left(\frac{6}{2}\right)^{th}$ term = 3rd term.

So, Median = 4

(iii) **Mean**: $\bar{x} = \frac{\sum x_i}{n} = \frac{2+3+4+5+5}{5} = \frac{19}{5}$

Mean = 3.8

(b) If the numbers represented codes for the colors of T-shirts ordered from a catalog, which average(s) would make sense?

→ Mode.

(c) If the numbers represented one-way mileages for trails to different lakes, which average(s) would make sense.

→ Mean
Median
Mode

(d) Suppose the numbers represent survey responses from 1 to 5, with 1 - disagree strongly, 2 - disagree, 3 - agree, 4 - agree strongly and 5 - agree very strongly. which averages make sense?

→ Mode
Median.

Q2 Consider a data set of 15 distinct measurements with mean A and median B.

(a) If the highest number were increased, what would be the effect on the median and mean? Explain.

→ As the highest number is increased, the value of Σx_i will also increase. So, the mean would increase while the median would remain the same.

(b) If the highest number were decreased to a value still larger than B, what would be the effect on the median and mean?

→ As the highest number is decreased, the value of Σx_i will also decrease, So, the mean would decrease while the median would remain the same.

(c) If the highest number were decreased to a value smaller than B, what would be the effect on the median and mean?

→ As the highest number is decreased to a value smaller than B, both mean and median would decrease.

Q3 Consider the data set 1, 2, 3, 6, 10.

(a) compute the mode, median and mean.

→ Mode: Value that occurs with greatest frequency.

Mode = 2

Median: (For odd nos) = $\left(\frac{n+1}{2}\right)^{th}$ term

$= \left(\frac{6}{2}\right)^{th}$ term $= 3^{rd}$ Term.

Median = 3

Mean: $\bar{x} = \frac{\sum x_i}{n} = \frac{2+2+3+6+10}{5}$

Mean: $\bar{x} = \frac{23}{5} = 4.6$

(b) Multiply each data value by 5. Compute the mode, median and mean.

→ New data value: 10, 10, 15, 30, 50.

Mode: 10

Median: $\left(\frac{n+1}{2}\right)^{th}$ term $= \left(\frac{6}{2}\right)^{th}$ term

Median = 15

Mean: $\bar{x} = \frac{\Sigma x_i}{n} = \frac{10+10+15+30+50}{5} = \frac{115}{5}$

Mean: $\bar{x} = 23$

(c) Compare the results of part (a) & (b).

→ In part (a) Mode = 2
After multiplying each data value by 5
In part (b) Mode = 10

In part (a) Median = 3
After multiplying each data value by 5
In part (b) Median = 15

In part (a) Mean = 4.6
After multiplying each data value by 5
In part (b) Mean = 23.

- In general when each data value in a set is multiplied by the same constant, the result of mean, median and mode is same if multiplied by the same constant.

(d) Suppose you have information about average weights of a random sample of airplane passengers. The mode is 70 inches, the median is 68 inches and the mean is 71 inches. To convert the data into centimeters, multiply each data value by 2.54. What are the values of the mode, median and mean in centimeters?

→ As we already know that the result of Mode, Median and Mean remains the same if multiplied by the same constant.
So, the value of Mode, Median and Mean in centimeters are
Mode = 70 × 2.54 = 177.8 cms
Median = 68 × 2.54 = 172.72 cms
Mean = 71 × 2.54 = 180.34 cms.

Q4 Consider the data set 2, 2, 3, 6, 10.

(a) Compute the mean, median and mode.

→ Mean: $\bar{x} = \frac{\Sigma x_i}{n} = \frac{2+2+3+6+10}{5} = \frac{23}{5}$

$\bar{x} = 4.6$

Median: (for odd) = $\left(\frac{n+1}{2}\right)^{th}$ term

$= 6/2 = 3^{rd}$ Term.

Median = 3

Mode: Greatest frequency data

Mode = 2

(b) Add 5 to each data value. And compute Mean, Median and Mode.

New data set = 7, 7, 8, 11, 15

$\text{Mean}(\bar{x}) = \frac{\Sigma x_i}{n} = \frac{7+7+8+11+15}{5} = \frac{48}{5}$

$\bar{x} = 9.6$

Median = $\left(\frac{n+1}{2}\right)^{th}$ term = $6/2$ = 3rd Term

Median = 8

Mode = Greatest frequency data.

Mode = 7

(c) Compare the results of part (a) & (b).

→ In part (a) Mean = 4.6
After adding 5 to each data value
In part (b) Mean = 9.6

In part (a) Median = 3
After adding 5 to each data value
In part (b) Median = 8

In part (a) Mode = 2
After adding 5 to each data value
In part (b) Mode = 7

In general when the same constant is added to each data value, the result of mean, median and mode is also same if added by the same constant.

Q5 Environmental studies:

The following data are taken from a study conducted by the National Park system, of which Death valley is a unit.
The ground temperatures (°F) were taken from May to Nov in the vicinity of Furnace Creek.
146, 152, 168, 174, 180, 178, 179, 180, 178, 178, 168, 165, 152, 144.

Compute the mean, median and mode for these ground temperatures.

→ Mean: $\bar{x} = \frac{\Sigma x_i}{n} = \frac{2342}{14} = \underline{167.28}$

Median: (For Even): $\left(n/2\right)^{th}$ term $= \frac{14}{2}^{th}$ Term

Median = 7^{th} Term = 168

$\left(\frac{n+1}{2}\right)^{th}$ term $= 8^{th}$ term = 174

So, Median = $\frac{179 + 180}{2}$ = ~~179.5~~

Median = $\frac{168 + 174}{2} = 171$

Mode = 178

Q6 The following information is from a random sample of winter wolf packs in regions of Alaska, Minnesto, Michigan, Wisconsin, Canada and Finland.

winter pack size: 13, 10, 7, 5, 7, 7, 2, 4, 3, 2, 3, 15, 4, 4, 2, 8, 7, 8.

Compute the mean, median and mode for the size of winter wolf packs.

→ Mean: $\bar{x} = \frac{\Sigma x_i}{n} = \frac{111}{18} = 6.16$

Median: (For even) $= \frac{\left(\frac{n}{2}\right)^{th} + \left(\frac{n}{2}+1\right)^{th}}{2}$

Median: $\frac{9^{th} \text{ term} + 10^{th} \text{ term}}{2}$

Median $= \frac{5+7}{2} = \frac{12}{2} = 6$

Mode: 7

Q7 Upper Canyon: 2, 3, 1, 1, 3, 4, 6, 9, 3, 13.

Lower Canyon: 8, 1, 1, 0, 6, 7, 2, 14, 3, 0, 1, 13, 2, 1.

(a) Compute the Mean, Median and Mode for injuries per landing point in the upper canyon.

→ Mean: $\bar{x} = \frac{\Sigma x_i}{n} = \frac{36}{11} = 3.27$

Median: (for odd obs) $= \left(\frac{n+1}{2}\right)^{th}$ Term.

$= \left(\frac{12}{2}\right) = 6^{th}$ Term.

Median = 3

Mode: 3

(b) Compute the Mean, Median and Mode for injuries per landing point in the Lower Canyon.

→ Mean: $\bar{x} = \frac{\Sigma x_i}{n} = \frac{59}{14} = 4.21$

Median: (for Even obs) $= \frac{\left(\frac{n}{2}\right) + \left(\frac{n+1}{2}\right)}{2}$

Median = $\frac{7^{th} \text{ Term} + 8^{th} \text{ Term}}{2}$

Median = $\frac{2+2}{2} = 2$

Mode: 1

(c) compare the results of parts (a) and (b)

→ The Mean of Upper Canyon : 3.27
The Mean of Lower Canyon : 4.21

The Median of Upper Canyon : 3
The Median of Lower Canyon : 2

The Mode of Upper Canyon : 3
The Mode of Lower Canyon : 1

Q8 Costs in dollars per day in Island of Maui

89, 50, 68, 60, 375, 55, 500, 71, 40, 350, 60, 50, 250, 45, 45, 125, 235, 65, 60, 130.

(a) Compute the mean, median and mode for the data.

→ Mean: $\bar{x} = \frac{\Sigma x_i}{n} = \frac{2723}{20} = 136.15$

Median: (for Even obs) $= \frac{\left(\frac{n}{2}\right) + \left(\frac{n}{2}+1\right)}{2}$

$= \frac{10^{th}\ Term + 11^{th}\ Term}{2}$

$= \frac{60+60}{2} = 60$

$= \frac{65+68}{2} = 66.5$

Mode: 60