Review of Statistic

The measures of centralization are used to summarize the data numerically, so they are considered typical or ideal values of the data. These metrics are also used to describe the dataset, as well as to compare different datasets. Arithmetic average, arithmetic median and mode….

1-Mean ($\bar{y}$): It is taking the sum of a group of numbers, then dividing that sum by the count of the numbers sample used in the series. (Total Data of Values over Number of values).

Arithmetic mean = average = bar

$$\left[\bar{y} = \frac{\sum yi}{n}\right] \qquad \mu = \frac{\sum yi}{N}$$

μ = the population mean.　　　　　$\bar{y}$ = The Arithmetic Mean sample

N= size of the population,　　　　　n= number of observation sample

yi=each value from the population.　　yi= each value from the sample.

example:

We have the scores of a quiz taken by mathematics students in the grade. They are 76, 89, 45, 50, 88, 67, 75, 83. What is the mean score

Answer:

$$\text{mean=} \frac{\sum yi}{n} \frac{\sum 76+89+45+50+88+67+75+83}{8} = 71.625$$

If $\sum$=n and Which

Demonstrate that: 1-　$\sum(yi - \bar{y}) = 0$　2-　$\sum(yi-\bar{y})^2 = \sum yi^2 - \frac{(\sum yi)^2}{n} = ss$

1. $\sum(yi - \bar{y}) = 0 \Longrightarrow = \sum yi - \sum_1 \bar{y} = \sum yi - n\frac{\sum yi}{n} = \sum yi - \sum yi = o$

2. $\sum (yi - \bar{y})^2 = \sum yi^2 - \dfrac{(\sum yi)^2}{n}$

$$\sum (yi^2 - 2\bar{y}\, yi + \bar{y}^2) = \sum yi^2 - 2\bar{y} \sum yi + n(\bar{y})^2$$

$$= \sum yi^2 - 2(\dfrac{\sum yi}{n})(\sum yi) + n\dfrac{(\sum yi)^2}{n^2} = \sum yi^2 - 2\dfrac{(\sum yi)^2}{n} + \dfrac{(\sum yi)^2}{n} \qquad = \sum yi^2 - \dfrac{(\sum yi)^2}{n}$$

- If the values of variable X and Y are:

Xi = 4, 2, 3, 7   and   Yi = 3, 9, 6, 2   Find the Values of:

1. $\sum yi^2$

2. $(\sum yi)^2 = (\sum yi)^2 = \sum(3+9+6+2)^2 = (20)^2 =$

3. $\sum xiyi^2 =$

4. $\sum(xi-3)(yi+2) =$

5. $\sum (2xi)$, $\sum 4xi$ $\sum\limits_{i=1}^{3}(xi+2)$

6- $\dfrac{\sum xi}{4}$

$\sum xiyi^2 = (4)(3)^2 + (2)(9)^2 \ldots + (7)(2)^2 =$

$\sum(xi-3)(yi+2) = (4-3)(3+2) + \ldots (7-3)(2+2) =$

$\sum\limits_{i=1}^{3}(xi+2)$ = (4+2)+ (2+2) (3+2)=

$\sum(2xi) = (2*4)+(2*2) +(2*3) +(2*7) =$

$\sum 4xi = 4 (4+2+3+7) =$

$\sum xi/4 = 4$

$\sum yi^2 = 3^2 + 9^2 + 6^2 + 2^2 =$

$\sum xiyi = (4*3)+(2*9)+(3*6)+(7*2)$

2-Median(Me)الوسيط :, in statistics, is the middle value of the given list of data, when arranged in an order. The arrangement of data or observations can be done either in ascending order or descending order. which is used to find the center value. $M = \frac{N+1}{2}$, $M = Sum\ of\ \frac{N}{2}\ and\ \frac{N}{2}+1$

Median الوسيط=(n+1)/2 or (yn/2 + yn/2+1)/2

Example: from the data below compute Median.
Xi = (5, 7, 8, 3, 9, 6, 7, 4, 8)

Solution:
Order the sample as follow: (3, 4, 5, 6, 7, 7, 8, 8, 9)
Sine (xi) was odd number so:-

Median series ($M\underline{e}$): $= \frac{n+1}{2} = \frac{9+1}{2} = 5$ Median=7

example:2: The scores of an exam taken by 7 students are given below. Find the median score.87, 56, 78, 66, 73, 71, 79

Answer: Rearrange the numbers from lowest to highest.

56, 66, 71, 73, 78, 79, 87

The number of value points is odd, so the middle number becomes the median score.
Median =(n+1)/2 =7+1/2=4   Median= 73

Example3:

the ages of 12 students in grade 11 were collected, and the values are as follows: 15, 21, 19, 19, 20, 18, 17, 16, 17, 18, 19, 18. Find the median age.

Answer:

Arrange these values in ascending order:

15, 16, 17, 17, 18, 18, 18, 19, 19, 19, 20, 21

Since the number of data points is even, we will have two middle numbers, which are both 18. Median (yn/2 + yn/2+1)/2= 12/2+12/2+1 So the median is 18.

3=Range(R): Term for a range of values is the difference between the highest value and lowest value in that group.

Range- largest value – smallest value
- This is ONE number

1-example

3, 5, 7, 9, 11
- Find the range
  - Largest-smallest
    - 11-3=8

4-Variance: (s^2): it is sum of squares of deviations divided by the degrees of freedom. The sample variance formula is =

$$S^2 = \frac{\sum(yi - \bar{y})^2}{n-1} = \frac{\sum yi^2 - \frac{(\sum yi)^2}{n}}{n-1}$$

Population variance

$$\sigma^2 = \frac{\sum_{i=1}^{N}(x_i - \mu)^2}{N}$$

Sample variance

$$s^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}$$

Where σ^2 = population variance s^2= **sample variance**

N = size of the population   **n = size of sample,**

yi=each value from the sample. yi=each value from the sample

example: find variance **if you yi=10, 7,6,8,5,6 .**

amswer:$s^2 = \dfrac{\sum yi^2 - \dfrac{(\sum yi)^2}{n}}{n-1}$ $= \sum 310 - (42)^2/6/6-1 = 310-294/5 = 16/5 = 3.2$

5= Standard deviation(s): الانحراف القياسي Standard deviation of a sample is the square root of the variance of the sample.

$$S = \sqrt{S^2} = \sqrt{\dfrac{\sum yi^2 - \dfrac{(\sum yi)^2}{n}}{n-1}} \qquad =1.79$$

6- Standard error (Sy): Standard Deviation of the Mean.

$$S_{\bar{y}} = \sqrt{\dfrac{s^2}{n}} = \dfrac{s}{\sqrt{n}} \quad \dfrac{1.79}{\sqrt{2}} = 0.7$$

7- Coefficient of variance (C.V):معامل الاختلاف The ratio percentages for the standard

$$C.V\% = \dfrac{s}{\bar{y}}*100 \quad \dfrac{1.79}{7}*100 = 25.5$$

<u>**example**</u> Consider the following sample of 7 observations:

yi = 5, 7, 4, 5, 6, 2, 6

-calculate: 1-mean , 2-(Me),3- (R) 4-(s²) 6- s,7-(Sy) 8- (C.V%)

Mean(x or y) == (5+7+4+5+6+2+6)/7= 5

Median (Me): First, we arrange the values Descending or Ascending ;2,4,5,5,6,6,7

=(n+1)/2=7+1)/2=4

 The median is the Value that arranged fourth.

Range (R) = Y max − Y min = 7-2 = 5

Variance (s²)

$$S^2 = \frac{\sum (yi - \bar{y})^2}{n-1} = \frac{\sum yi^2 - \frac{(\sum yi)^2}{n}}{n-1}$$

=[(5-5)²+ (7-5)²+ (4-5)²+ (5-5)²+ (6-5)²+ (2-5)²+ (6-5)²]/6= 16/6=

or

$$(5^2+ 7^2+ 4^2+ 5^2+ 6^2+ 2^2+ 6^2) - (5+7+4+5+6+2+6)^2/ 7$$
$$\overline{\hspace{6cm}}$$
$$7-1$$

= [191-(1225/7)]/6= (191-175)/6= 16/6 =2.67

Standard deviation(s) = $\sqrt{S^2}$

Standard error $S_{\bar{y}} = \sqrt{\frac{s^2}{n}} = \frac{s}{\sqrt{n}}$

=1.634 /   7 $\sqrt{}$ (1.634/5)*100 = 32.68%

$C.V\% = \frac{s}{\bar{y}} * 100$ =?

Example 1 home work: Find the 1-mean , 2-(Me),3- (R) 4-(s²) 6- s,7-(Sy) 8- (C.V%) of the given data set Yi=2,5,9,11,13