# **STATEMENT**:

One of the major measures of the quality of service provided by an organization in the speed with which it responds to customer complaints. An internet service provider, had undergone a major improvement by recruiting well trained installation crews, supervisors, and office staffs. The business objective of the company was to reduce the time between when the complaint it received and when it is resolved. During a recent month, the company received 50 complaints concerning internet installation. The data from the 50 complaints, collected by ISP, represent the number of hours between the receipt and the resolution of the complaint.

27,4,52,30,22,36,26,20,23,33,68,165,32,29,28,29,26,25,1,14,13,13,10,5,19,126,110,110,29,61,35,94,31,26,5,12,4,54,5,35,137,31,27,152,2,123,81,74,27,11

By using appropriate software:

1. Compute mean, median, first quartile, and third quartile.
2. Compute the range, interquartile range, variance, standard deviation, and coefficient of variation.

# **WORKING EXPRESSION:**

1. **Frequency distribution:**

A tabular display containing the variant values along with the frequencies is called frequency distribution. If the frequency distribution is made by taking the certain class interval, the frequency distribution is said to be continuous frequency distribution.

1. **Arithmetic mean:**

The ratio of the sum of all observations to the total number of observations is called mean. It is denoted by .It is given by (for continuous series):

 = 

Where, N =  = Total frequency.

1. **Median:**

The middle most value of ordered set of data is called median. It is denoted by Md and given by (for continuous series):

Md = 

1. **First Quartile:**

The value of ordered set of data which has 25% of data below it is called first quartile. It is denoted by Q1 and given by (for continuous series):

Q1 = 

1. **Third Quartile:**

The value of ordered set of data which has 25% of data above it is called third quartile. It is denoted by Q3 and given by (for continuous series):

Q3 = 

Where, L= lower limit of median class

 =position of quartile

f = frequency of median class

c.f. = preceding frequency to the median class

h= class interval of median class

1. **Range:**

The difference between the largest value and the smallest value in an ordered set of data is known as range. It is given by:

Range = L-S

Where, L = Largest data,

S = Smallest data

1. **Interquartile Range:**

The difference between the third quartile and the first quartile in an ordered set of data is known as interquartile range (IQR). It is given by:

IQR = Q3 - Q1

Where, Q3 =Third Quartile,

Q1 =First Quartile

1. **Standard Deviation:**

Standard Deviation is the square root of the mean of the standard deviations from the arithmetic mean. It is denoted by sigma () given by (for continuous series):

 = 

Where, N =  = Total frequency

1. **Variance:**

The square of the standard deviation is known as variance. It is denoted by Var(x) and is given by:

Var(x) = 2

Where,  is Standard Deviation.

1. **Coefficient of Variation**:

The relative measure based on the standard deviation and defined as the ratio of the standard deviation to the mean expressed in percent is known as coefficient of variation. It is denoted by C.V. and is given by:

Where, is Standard Deviation,

is Arithmetic Mean.

# **CALCULATION**:

1. The arithmetic mean, median, first quartile and third quartile are calculated as:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Class Interval** | **Frequency** | **mid-value(m)** | **c.f.** | **fm** | **fm²** |
| 0-20 | 14 | 10 | 14 | 140 | 1400 |
| 20-40 | 22 | 30 | 36 | 660 | 19800 |
| 40-60 | 2 | 50 | 38 | 100 | 5000 |
| 60-80 | 3 | 70 | 41 | 210 | 14700 |
| 80-100 | 2 | 90 | 43 | 180 | 16200 |
| 100-120 | 2 | 110 | 45 | 220 | 24200 |
| 120-140 | 3 | 130 | 48 | 390 | 50700 |
| 140-160 | 1 | 150 | 49 | 150 | 22500 |
| 160-180 | 1 | 170 | 50 | 170 | 28900 |
|  | **N=50** |  |  | **∑fm = 2220** | **∑fm² = 183400** |

1. Mean

We have,

∑fm = 2220  
 N = 50

= 44.4

1. Median

We have,

Size of Md == th item

The c.f. just greater than 25 is 36.

Md class = 20 – 40  
 L = 20  
 f = 22

c.f. = 14  
 h = 20

Hence,

Md = L+ h

= 20+ 20

= 30

Md = 30

1. First quartile

We have,

Size of Q1== th item

The c.f. just greater than 12.5 is 14.

Q1class = 0 – 20  
 L = 0  
 f = 14

c.f. = 0  
 h = 20

Hence,

Q1= L+ h

= 0+ 20

= 17.857

Q1 = 17.857

1. Third quartile

We have,

Size of Q3== th item

The c.f. just greater than 37.5 is 38.

Q3class = 40 – 80  
 L = 40  
 f = 2

c.f. = 22  
 h = 20

So, Q3= L+ h

= 40+ 20

= 195

Q3 = 195

1. Similarly, the range, interquartile range, standard deviation, variance and coefficient of variance are calculated as:
2. Range

Largest data(L) = 180  
Smallest data(S) = 0

Range = L – S

= 180

1. Interquartile range

IQR = Q3 – Q1

= 195 – 17.857

= 177.143

1. Standard deviation

σ = 

= 

= 41.19

1. Variance

σ 2 = (41.19)2

= 1696.6161

1. Coefficient of variance

C.V = 

= 

= 92.77%

# **RESULT**:

The arithmetic mean, median, first quartile and third quartile are 44.4, 30, 17.857 and 139 respectively, as well as range, interquartile range, standard deviation, variance and coefficient of variance are 180, 177.143, 41.19, 1696.6161 and 92.77% respectively.

# **CONCLUSION**:

Hence, in this way using MS-Excel and MS-WORD the arithmetic mean, median, first quartile, third quartile as well as range, interquartile range, standard deviation, variance and coefficient of variance were computed.