Some other Positional Measure

Median is the most important positional measure. It divides the whole distribution into two equal parts. That is 50% observations are equal to or smaller than median and 50% observations are equal to or larger than the median . Other important positional measures are

- Quartiles
- Deciles
- Percentiles

In general, Quartiles, Deciles and Percentiles are all known as quartiles.

Quartiles

Quartiles divide the ordered data into 4 equal parts. So there are three quartiles. They are Q_1, Q_2 *and* Q_3. Q_2 is the median, Q_1 and Q_3 are called the first and third quartiles.

- The first quartile, Q_1,is a value for which 25% of the observations are equal to or smaller than Q_1 and 75% are equal or larger than Q_1

- The second quartile, Q_2,is a value for which 50% of the observations are equal to or smaller than Q_2 and 50% are equal or larger than Q_2

- The third quartile, Q_3,is a value for which 75% of the observations are equal to or smaller than Q_3 and 25% are equal or larger than Q_3

Deciles

Deciles divide the total ordered data into 10 equal parts. So there are nine deciles.
They are denoted by D_1 , D_2,... D_9.

- ❑ D_5 is the median.

Percentile

Percentiles divide the total ordered data into 100 equal parts. So there are 99 Percentiles.
They are denoted by $P_1 , P_2 ,... P_{99.}$

- P_{50} is the median or 5th decile or 2nd quartile of the distribution.
- P_{25} is the first quartile
- P_{75} is the third quartile
- P_{20} is the second decile

Computation of Quartiles, Deciles and Percentiles from grouped data of continuous type

The following formulae are used for finding Quartiles, Deciles and Percentiles

The ith quartile, $Q_i = L_i + \frac{\frac{in}{4} - F_i}{f_i} \times c_i$,for i=1,2,3.

The jth decile , $D_j = L_j + \frac{\frac{jn}{10} - F_j}{f_j} \times c_j$, for j=1,2,……,9

The kth percentile, $P_k = L_k + \frac{\frac{kn}{100} - F_k}{f_k} \times c_k$, for k=1,2,……99.

Example

The following frequency distribution refers to the number of hours worked per month of 50 workers of a factory. Compute Q_1, Q_3, D_3, P_{65} and interpret the values you obtained.

No. of hours worked per month	Frequency
30-55	3
55-80	4
80-105	6
105-130	9
130-155	12
155-180	11
180-205	5

Solution

Class	Frequency f	Cumulative frequency F
30-55	3	3
55-80	4	7
80-105	6	13
105-130	9	22
130-155	12	34
155-180	11	45
180-205	5	50
Total	n =50	

First Quartile Q_1

Here n=50. First quartile Q_1 is the $\frac{n}{4}$th ordered observation=12.5th ordered observation which lies in the class interval 80-105.

We know that $Q_1 = L_1 + \frac{\frac{n}{4} - F_1}{f_1} \times c_1$

Here L_1=80, $\frac{n}{4}$=12.5, F_1=7, $f_1 = 6$ and c_1=25

Then Q_1=102.92 hours per month

Comment: 25% of the workers worked for 102.72 hours or less per month whereas 75% worked for more than 102.72 hours.

Third Quartile Q_3

Here n=50. Third quartile Q_3 is the $\frac{3n}{4}$th ordered observation=37.5th ordered observation which lies in the class interval 155-180.

We know that $Q_3 = L_3 + \frac{\frac{3n}{4} - F_3}{f_3} \times c_3$

Here L_3=80, $\frac{n}{4}$=12.5, F_3=7, $f_3 = 6$ and c_3=25

Then Q_3=162.95 hours per month

Comment: 75% of the workers worked for 162.95 hours or less per month whereas 25% worked for more than 162.95 hours.

Third Decile

Here n=50. Third decile D_3 is the $\frac{3n}{10}$th ordered observation=15th ordered observation which lies in the class interval 105-130.

We know that D_3=$L_3 + \frac{\frac{3n}{10} - F_3}{f_3} \times c_3$

Here L_3=105, $\frac{3n}{10}$=15, F_3=13, $f_3 = 9$ and c_3=25

Then Q_3=110.56 hours per month

Comment: 30% of the workers worked for 110.56 hours or less per month whereas 70% worked for more than 110.56 hours per month.

Sixty fifth percentile P_{65}

Here n=50. Sixty fifth percentile P_{65} is the $\frac{65n}{100}$th ordered observation=32.5th ordered observation which lies in the class interval 130-155.

We know that P_{65}=$L_{65}+\frac{\frac{65n}{100}-F_{65}}{f_{65}}\times c_{65}$

Here L_{65}=130, $\frac{65n}{100}$=32.5, F_{65}=22, $f_{65}=12$ and c_{65}=25

Then Q_3=151.875 hours per month

Comment: 65% of the workers worked for 151.875 hours or less per month whereas 35% worked for more than 151.875 hours per month.

Thank You… ☺ ☺ ☺