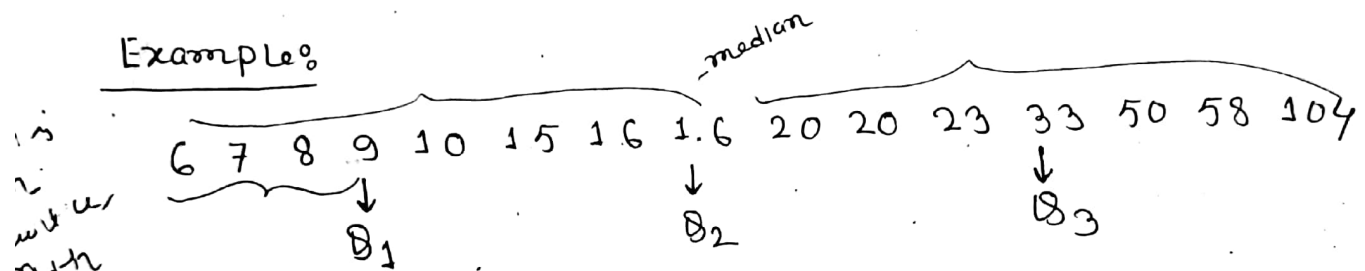


Quartiles:

Quartiles are those values, which divide the total frequency into four equal parts.

The three quartiles,  $Q_1$ ,  $Q_2$  and  $Q_3$  divide an ordered data set into four equal parts. About one-quarter of the data fall on or below the first quartile  $Q_1$ . About one-half of the data fall on or below the second quartile  $Q_2$  (the second quartile is the same as the median of the data set). About three-quarters of the data fall on or below the third quartile  $Q_3$ .

Example:

For grouped frequency distribution the quartiles are given by

$$Q_i = L + \frac{\frac{N}{4}i - fc}{f} \times c, i=1,2,3$$

where,

$L$  = Lower limit of the  $i$ -th quartile class  
( $i$ th quartile class is that class which contains the  $\frac{N}{4}i$ -th observation).

$N$  = Total number of observation

$fc$  = cumulative frequency of the pre- $i$ th quartile class.

$f_i$  = frequency of the  $i$ -th quartile class  
 $c$  = Length of the class interval of the  $i$ -th quartile class.

### Decile:

Deciles are those values that divide the total frequency into 10 equal parts.

The median is the 5th decile.

For grouped frequency distribution deciles are given by

$$D_i^o = L + \frac{\frac{N}{10}i - f_c}{f_D} \times c ; i = 1, 2, \dots, 9$$

Where,

$L$  = Lower Limit of the  $i$ th decile class ( $i$ th decile class contains the  $\frac{N}{4}$   $i$ th observation)

$N$  = Total number of observation.

$f_c$  = Cumulative frequency of the pre- $i$ th decile class.

$f_D$  = Frequency of the  $i$ -th decile class

$c$  = Length of the class interval of the  $i$ th decile class.

## Percentiles:

Percentiles are those values which divide the total frequency into 100 equal parts. The median is the 50th percentile.

For grouped frequency distribution, the percentiles are given by

$$P_i = L + \frac{\frac{N}{100}i - f_c}{f_p} \times c, \quad i=1, 2, \dots, 99$$

where,

$L$  = Lower Limit of the  $i$ -th percentile class  
 $i$ -th percentile class is that class which contains the  $\frac{N}{100}i$ -th observation.

$N$  = Total number of observation

$f_c$  = cumulative frequency of the pre- $i$ -th percentile classes.

$f_p$  = Frequency of the  $i$ -th percentile class.

$c$  = Length of class interval of the  $i$ -th percentile class.

Problem:

Calculate 3<sup>rd</sup> quartile, 7<sup>th</sup> decile and 60<sup>th</sup> percentile from the following frequency distribution:

Class interval	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	4	5	10	12	8	6	4	3

Sol<sup>n</sup>:

Class Interval	Frequency	Cumulative frequency
10-20	3	3
20-30	4	7
30-40	5	12
40-50	10	22
50-60	12	34
60-70	8	42
70-80	6	48
80-90	4	52
90-100	3	55

### 3rd Quartile:

Here,

$$N=55, \quad \frac{3 \times N}{4} = \frac{3 \times 55}{4} = 41.25$$

(60-70) is the 3rd quartile class ( $Q_3$ ) because

$\frac{3N}{4}$ th = 41.25th observation lies in this class.

$$\begin{aligned} \therefore Q_3 &= L_3 + \frac{\frac{3 \times N}{4} - f_c}{f_3} \times c \\ &= 60 + \frac{41.25 - 34}{8} \times 10 \\ &= 69.06 \text{ (Ans)} \end{aligned}$$

### 7th Decile:

$$\text{Here, } N=55, \quad \frac{7N}{10} = \frac{7 \times 55}{10} = 38.5$$

So (60-70) is the 7th decile ( $D_7$ ) class as

$\frac{7N}{10}$ th = 38.5th observation lies in this class.

$$\begin{aligned} D_7 &= L_7 + \frac{\frac{N \times 7}{10} - f_c}{f_D} \times c \\ &= 60 + \frac{38.5 - 34}{8} \times 10 \\ &= 65.625 \text{ (Ans)} \end{aligned}$$

60th percentile:

$$\frac{60N}{100} = \frac{60 \times 55}{100} = 33$$

So (50-60) is the 60th percentile class ( $P_{60}$ )

as  $\frac{60N}{100}$ th = 33<sup>th</sup> observation lies in this class.

$$P_{60} = 50 + \frac{\frac{N}{100} \times 60 - 22}{12} \times 10$$

$$= 50 + \frac{33 - 22}{12} \times 10$$

$$= 59.16$$

H.W Find the median, mode, 1<sup>st</sup> and 3<sup>rd</sup>

Quartile, 8<sup>th</sup> decile and 77<sup>th</sup> percentile from the following frequency distribution:

Class Interval	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	18	30	46	28	20	12	6