Measures of Dispersion (II)

(3) Frequency Distribution Series and Quartile Deviation:-

following illustration should explain the calculation of quartile deviation in frequency distribution series.

Illustration. Find out quartile deviation of the following series.

Age (year)	0-20	20-40	40-60	60-80	80-100
No. of pers	4	10	15	20	11

Soln

Age (year)	No of Persons	Cumulative frequency
0-20	4	4
20-40	10	14
40-60	15	29
60-80	20	49
80-100	11	60
	N = 60	

Q_1 = Size of $\frac{N}{4}$ th items = Size of $\frac{60}{4}$ th item

= Size of 15th item.

15th item lies in group 40-60 and fall within 29th cumulative frequency of the series.

$$Q_1 = l_1 + \frac{\frac{N}{4} - cf}{f} \times i$$

Here l_1 = lower limit of the C.Q.

N = Sum of frequencies.

cf = C.f of the pre quartile class

f = frequency of the quartile class.

i = Class interval of quartile class.

Thus,

$$Q_1 = 40 + \frac{\frac{60}{4} - 14}{15} \times 20.$$

$$= 40 + \frac{15 - 14}{15} \times 20$$

$$= 40 + \frac{1}{15} \times 20$$

$$40 + \frac{20}{15} = 40 + 1.33 = 41.33$$

Like-wise

Q_3 = Size of $3\left(\frac{N}{4}\right)$th item

Size of $= \left(\frac{60}{4}\right)$th item.

$= 45$th item.

$\therefore$ 45th item falls with in 49 th

15th item falls with in 49 th

cumulative frequency of the series.

Thus,

$$Q_3 = l_1 + \frac{3\left(\frac{N}{4}\right) - C}{f} \times i$$

$$= 60 + \frac{3\left(\frac{60}{4}\right) - 29}{20} \times 20$$

$$60 + \frac{45 - 29}{20} \times 20 = 60 + \frac{16}{20} \times 20 = 60 + 16 = 76$$

Having known the value of Q_1 and Q_3, Quartile Deviation is found as

$$QD = \frac{Q_3 - Q_1}{2} = \frac{76 - 41.33}{2} = \frac{34.67}{2}$$

$$= 17.34.$$

and Coefficient of $QD = \frac{Q_3 - Q_1}{Q_3 + Q_1}$

$$= \frac{76 - 41.33}{76 + 41.33} = \frac{34.67}{117.33}$$

$$= 0.30$$

$QD = 17.34$ Coefficient of $QD = 0.30$