

**Measure of dispersion:**

**Quartile deviation:**

**Inter-quartile range:  $Q_3 - Q_1$**

**Semi inter quartile range/quartile deviation:**

$$Q.D = \frac{Q_3 - Q_1}{2}$$

$$Q_i = L_i + \frac{\frac{Ni}{4} - f_c}{f_q} \cdot c; i = 1, 2, 3$$

**Problem: Calculate quartile deviation from the following frequency distribution and also calculate standard deviation using empirical relation:**

<b>Class interval</b>	<b>Frequency</b>
<b>0-5</b>	<b>5</b>
<b>5-10</b>	<b>13</b>
<b>10-15</b>	<b>12</b>
<b>15-20</b>	<b>7</b>
<b>20-25</b>	<b>3</b>
<b>25-30</b>	<b>5</b>

**We know that,**

**Quartile deviation=(2/3) standard deviation**

**Standard deviation=(3/2).(11.57)=17.36**

### **Empirical relation between measure of dispersion:**

- i) Quartile deviation= $(2/3)$  standard deviation
- ii) Mean deviation= $(4/5)$  standard deviation
- iii) Quartile deviation= $(5/6)$  mean deviation

### **Calculating missing using median formula:**

**Problem:** An incomplete frequency distribution is given below. where the median is 33.5. Determine the missing frequency by applying median's formula.

Variables	Frequency
0-10	4
10-20	16
20-30	?
30-40	100
40-50	?
50-60	6
60-70	4
	N=230 and median=33.5

**Solution:**

Variables	Frequency	Cumulative frequency
0-10	4	4
10-20	16	20
20-30	$f_1$	$20 + f_1$
30-40(median class)	100	$120 + f_1$
40-50	$f_2$	$120 + f_1 + f_2$
50-60	6	$126 + f_1 + f_2$
60-70	4	$130 + f_1 + f_2$
	N=230 and median=33.5	

Let the missing frequencies be  $f_1$  and  $f_2$   
Here

$$\begin{aligned}
 N &= 130 + f_1 + f_2 \\
 \Rightarrow 230 &= 130 + f_1 + f_2 \\
 \Rightarrow f_1 + f_2 &= 100 \dots (i)
 \end{aligned}$$

We know that,

$$M_e = L_1 + \frac{\frac{N}{2} - f_c}{f_m} \cdot c \dots (ii)$$

$$\text{Here } N = 230; \frac{N}{2} = \frac{230}{2} = 115$$

$$M_e = L_1 + \frac{\frac{N}{2} - f_c}{f_m} \cdot c$$

$$\Rightarrow 33.5 = 30 + \frac{115 - (20 + f_1)}{100} \cdot 10$$

$$\Rightarrow 33.5 - 30 = \frac{95 - f_1}{10}$$

$$\Rightarrow 35 = 95 - f_1$$

$$\Rightarrow f_1 = 60$$

$$\text{From (i)} 60 + f_2 = 100; f_2 = 40$$

*So the missing frequencies be 60 and 40.*

### Graphical representation of data:

- i) **Histogram:**(X-axis: continuous class interval and Y-axis: frequency)
- ii) **Frequency polygon:** (X-axis: mid values of the continuous class interval and Y-axis: frequency)
- iii) **Cumulative frequency curve or Ogive:** (X-axis: upper limit of the continuous class interval and Y-axis: cumulative frequency)

**Problem: Draw Histogram, frequency polygon and Ogive from the following frequency distribution:**

<b>Class interval</b>	<b>Mid values</b>	<b>Frequency</b>	<b>Cumulative frequency</b>
<b>0-5</b>	<b>2.5</b>	<b>5</b>	<b>5</b>
<b>5-10</b>	<b>7.5</b>	<b>13</b>	<b>18</b>
<b>10-15</b>	<b>12.5</b>	<b>12</b>	<b>30</b>
<b>15-20</b>	<b>17.5</b>	<b>7</b>	<b>37</b>
<b>20-25</b>	<b>22.5</b>	<b>3</b>	<b>40</b>
<b>25-30</b>	<b>27.5</b>	<b>5</b>	<b>45</b>

**Next class:**

**Moments, Skewness and kurtosis:**