Graphical representation of data:

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

Problem: Draw Histogram, Frequency polygon and Ogive curve from the following data:

Continuous Class interval	Mid value	Frequency	Cumulative frequency
0-5	2.5	5	5
5-10	7.5	13	18
10-15	12.5	12	30
15-20	17.5	7	37
20-25	22.5	8	45
25-30	27.5	5	50

Moments, skewness and kurtosis:

Moments:

Raw moment:

$$\mu'_r = \frac{\sum_{i=1}^{n}(x_i - A)^r}{N}$$

$$A = any\ arbitrary\ value; r = 1, 2, 3, ..$$

$$\mu'_1 = \frac{\sum_{i=1}^{n}(x_i - A)^1}{N}$$

$$\mu'_2 = \frac{\sum_{i=1}^{n}(x_i - A)^2}{N}$$

Central moment:

$$\mu_r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^r}{N}$$

$$\bar{x} = mean; r = 1, 2, 3, ..$$

$$\mu_1 = \frac{\sum_{i=1}^{n} f_i(x_i - \bar{x})^1}{N}$$

$$= \frac{\sum_{i=1}^{n} f_i x_i}{N} - \frac{\sum_{i=1}^{n} f_i \bar{x}}{N}$$

$$= \bar{x} - \bar{x} = 0$$

$$\mu_2 = 2nd\ central\ moment = \frac{\sum_{i=1}^{n} f_i(x_i - \bar{x})^2}{N} = \sigma^2 = variance$$

Relation between raw moment and central moment:

i) $\mu_1 = 0$

ii) $\mu_2 = \mu'_2 - (\mu'_1)^2$

$2nd\ central\ moment = 2nd\ raw\ moment - (1st\ raw\ moment)^2$

Symmetrical distribution:

i)   Mean=median=mode

ii) $Q_3 - median = median - 1st\ quartile$

iii) $\mu_1 = \mu_3 = \mu_5 = \cdots = 0$

Skewness: Skewness means lack of symmetry

Skewness are two types:
i)   **Positive skewness:** $mean > median > mode$
ii)   **Negative skewness:** $mean < median < mode$