

**ID:**

**Question 1:**

**Marks: 6**

Calculate Harmonic Mean from the data given below:

X	f	f/X
125	3	<b>3/125 = 0.024</b>
130	5	<b>3/130 = 0.0385</b>
135	8	<b>8/135 = 0.0593</b>
140	9	<b>140/9 = 0.0643</b>
145	3	<b>145/3 = 0.0207</b>
	$\sum f = 3 + 5 + 8 + 9 + 3$ $\sum f = 28$	$\sum \frac{f}{X} = 0.024 + 0.0385 + 0.0593 + 0.0643 + 0.0207$ $\sum \frac{f}{X} = 0.2068$

*So*

$$\sum f = 3 + 5 + 8 + 9 + 3$$

$$\sum f = 28$$

*and*

$$\sum \frac{f}{X} = 0.024 + 0.0385 + 0.0593 + 0.0643 + 0.0207$$

$$\sum \frac{f}{X} = 0.2068$$

*Now Applying Harmonic Mean Formula*

$$H.M = \frac{\sum f}{\sum \frac{f}{X}} = \frac{28}{0.2068}$$

$$H.M = 135.397 \dots \text{Result}$$

**Question 2:****Marks:8**

Calculate Bowleys Coefficients of Skewness from the following data.

Class Limits	Frequency	Cumulative Frequency	Class Boundaries
1-5	5	5	<b>0.5-5.5</b>
6-10	12	5+12 = <b>17</b>	<b>5.5-10.5</b>
11-15	18	17+18= <b>35</b>	<b>10.5-15.5</b>
16-20	20	35+20= <b>55</b>	<b>15.5-20.5</b>
21-25	10	55+10= <b>65</b>	<b>20.5-25.5</b>

$$\frac{n}{4} = \frac{65}{4} = 16.25$$

$$2\left(\frac{n}{4}\right) = 2\left(\frac{65}{4}\right) = \frac{65}{2} = 32.5$$

$$3\left(\frac{n}{4}\right) = 3\left(\frac{65}{4}\right) = \frac{195}{4} = 48.75$$

Now

$$Q_1 = l + \frac{h}{f} \left( \frac{n}{4} - c \right)$$

$$Q_1 = 5.5 + \frac{5}{12} (16.25 - 5)$$

$$Q_1 = 5.5 + \frac{5}{12} (11.25)$$

$$Q_1 = 5.5 + \frac{56.25}{12}$$

$$Q_1 = \frac{66 + 56.25}{12}$$

$$Q_1 = \frac{122.25}{12}$$

$$Q_1 = 10.1875$$

and

$$Q_2 = l + \frac{h}{f} \left( \frac{2n}{4} - c \right)$$

Putting the Value in it

$$Q_2 = 10.5 + \frac{5}{18} (32.5 - 17)$$

$$Q_2 = 10.5 + \frac{5}{18} (15.5)$$

$$Q_2 = 10.5 + \frac{77.5}{18}$$

$$Q_2 = \frac{189 + 77.5}{18}$$

$$Q_2 = \frac{266.5}{18}$$

$$Q_2 = 14.8056$$

and

$$Q_3 = l + \frac{h}{f} \left( \frac{3n}{4} - c \right)$$

Putting the Value in it

$$Q_3 = 15.5 + \frac{5}{20} (48.75 - 35)$$

$$Q_3 = 15.5 + \frac{5}{20} (13.75)$$

$$Q_3 = 15.5 + \frac{68.75}{20}$$

$$Q_3 = \frac{310 + 68.75}{20}$$

$$Q_3 = \frac{378.75}{20}$$

$$Q_3 = 18.9375$$

And

$$\text{Bowleys Coefficients of Skewness} = \frac{Q_1 + Q_3 - 2Q_2}{Q_3 - Q_1}$$

$$\text{Bowleys Coefficients of Skewness} = \frac{10.1875 + 18.9375 - 2(14.8056)}{18.9375 - 10.1875}$$

$$\text{Bowleys Coefficients of Skewness} = \frac{10.1875 + 18.9375 - 29.6112}{18.9375 - 10.1875}$$

$$\text{Bowleys Coefficients of Skewness} = \frac{-0.4862}{8.75}$$

$$\text{Bowleys Coefficients of Skewness} = -0.0556 \dots \text{Result}$$

**Question 3:** **Marks: 6**

We are given first four moments of distribution about the origin as:

$$m'_1 = 1, m'_2 = 5, m'_3 = 12, m'_4 = 45$$

Calculate moments about mean.

**Solution**

$$m'_1 = m'_1 - m'_1$$

$$m'_1 = 1 - 1$$

$$m' = 0$$

*and*

$$m'_2 = m'_2 - (m'_1)^2$$

$$m'_2 = 5 - (1)^2$$

$$m'_2 = 5 - 1$$

$$m'_2 = 4$$

*and*

$$m'_3 = m'_3 - 3m'_2m'_1 + 2(m'_1)^3$$

$$m'_3 = 12 - 3(5)(1) + 2(1)^3$$

$$m'_3 = 12 - 15 + 2$$

$$m'_3 = -3 + 2$$

$$m'_3 = -1$$

*and*

$$m'_4 = m'_4 - 4m'_3m'_1 + 6m'_2(m'_1)^2 - 3(m'_1)^4$$

$$m'_4 = 45 - 4(12)(1) + 6(5)(1)^2 - 3(1)^4$$

$$m'_4 = 45 - 48 + 30 - 3$$

$$m'_4 = -3 + 30 - 3$$

$$m'_4 = 27 - 3$$

$$m'_4 = 24$$

