Data taken from 50 Ramen Shops in Kyoto, Japan

Prices of Ramen Bowl

Let's take an arbitrary value from Mid-Point column $a = 750$

As we already know that class interval is $h = 100$

So, we can change the origin and scale of data as follows

$$u_i = \frac{x_i - a}{h} = \frac{x_i - 750}{100}$$

Lower Class Limit	**Upper Class Limit**	**Frequency**	**Mid-Point (x_i)**	$\boldsymbol{u_i = \frac{x_i - 750}{100}}$
500	600	4	550	-2
600	700	13	650	-1
700	800	18	750	0
800	900	12	850	1
900	1000	3	950	2
		50		

u_i	u_i^2	u_i^3	u_i^4
-2	4	-8	16
-1	1	-1	1
0	0	0	0
1	1	1	1
2	4	8	16

$f_i u_i$	$f_i u_i^2$	$f_i u_i^3$	$f_i u_i^4$
-8	16	-32	64
-13	13	-13	13
0	0	0	0
12	12	12	12
6	12	24	48
-3	**53**	**-9**	**137**

Moments about Zero (After Changing Scale of a group data with equal class interval *h*)

$$m_r' = \frac{\sum_{i=1}^{n} f_i u_i^r}{\sum_{i=1}^{n} f_i} \times (h)^r$$

$$m_1' = \frac{\sum_{i=1}^{n} f_i u_i}{\sum_{i=1}^{n} f_i} \times h = \frac{-3}{50} \times 100 = -6$$

$$m_2' = \frac{\sum_{i=1}^{n} f_i u_i^2}{\sum_{i=1}^{n} f_i} \times h^2 = \frac{53}{50} \times (100)^2 = 10600$$

$$m_3' = \frac{\sum_{i=1}^{n} f_i u_i^3}{\sum_{i=1}^{n} f_i} \times h^3 = \frac{-9}{50} \times (100)^3 = -180000$$

$$m_4' = \frac{\sum_{i=1}^{n} f_i u_i^4}{\sum_{i=1}^{n} f_i} \times h^4 = \frac{137}{50} \times (100)^4 = 274000000$$

Moments about Mean

$$m_1 = m_1' - m_1' = 0$$

$$m_2 = m_2' - (m_1')^2$$

$$m_3 = m_3' - 3m_2'm_1' + 2(m_1')^3$$

$$m_4 = m_4' - 4m_3'm_1' + 6m_2'(m_1')^2 - 3(m_1')^4$$

Calculations:

$$m_1 = m_1' - m_1' = 0$$

$$m_1 = -6 - (-6) = 0$$

$$m_2 = m_2' - (m_1')^2$$

$$m_2 = 10600 - (-6)^2 = 10564$$

$$m_3 = m_3' - 3m_2'm_1' + 2(m_1')^3$$

$$m_3 = -180000 - 3(10600)(-6) + 2(-6)^3 = 10368$$

$$m_4 = m_4' - 4m_3'm_1' + 6m_2'(m_1')^2 - 3(m_1')^4$$

$$m_4 = 274000000 - 4(-180000)(-6) + 6(10600)(-6)^2 - 3(-6)^4$$

$$m_4 = 271965712$$