

Weighted Mean (المتوسط المرجح (الموزون)

Weighted Mean: In many cases, it may be necessary to weight the values of the phenomenon with different sizes or weights to indicate the relative importance of the phenomenon.

If we have the values $x_1, x_2, \dots, x_n$ and the corresponding weights are $w_1, w_2, \dots, w_n$ then the weighted mean is as follows

$$\textcircled{1} \quad \bar{X}_w = \frac{\sum_{i=1}^n w_i x_i}{\sum_{i=1}^n w_i} = \frac{w_1 x_1 + w_2 x_2 + \dots + w_n x_n}{w_1 + w_2 + \dots + w_n}$$

$$\textcircled{2} \quad \bar{X}_w = \frac{\sum_{i=1}^n w_i f_i x_i}{\sum_{i=1}^n w_i f_i}$$

للبيانات غير الموزونة
للبيانات الموزونة

Ex: The following data present Marks and number of study hours of a student for a set of study materials. Find the student's mean in these classes

Degrees x_i	Number of study hours		
75	3	94	3
87	2	61	4
63	3		

Solution:-

x_i	w_i	$x_i w_i$
75	3	225
87	2	174
63	3	189
94	3	282
61	4	244
	15	1114

$$\bar{X}_w = \frac{\sum x_i w_i}{\sum w_i}$$

$$= \frac{1114}{15}$$

$$= 72.26$$

Mode For Grouped Data

$$1 - \text{Mode} = L + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$$

where f_1 is the frequency of the modal class

f_0 is the frequency of the class preceding the modal class

f_2 is the frequency of the class succeeding the modal class

h is the size of the class intervals

L is the lower limit of the modal class

Ex: Find the mode of the following table:-

classes	f_i
1 - 3	7
3 - 5	8
5 - 7	2
7 - 9	2
9 - 11	1

7

Solution

1- we find the class which its frequency is the maximum

the class is 3-5 ($f_i = 8$)

the lower limit = 3

$$h = (5-3) = 2 \quad \text{طول الفئة}$$

Frequency of the modal class $f_1 = 8$

$$f_0 = 7 \quad (\text{التكرار السابق للفئة})$$

$$f_2 = 2 \quad (\text{التكرار اللاحق للفئة})$$

$$\text{Mode} = L + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$$

$$\text{Mode} = 3 + \left(\frac{8 - 7}{2(8) - 7 - 2} \right) \times 2$$

$$= \frac{23}{7}$$

$$= 3.286$$

() (8)

Example: Find the Mode of the following table

Classes	Frequency
3000 - 4000	4
4000 - 5000	18
5000 - 6000	9
6000 - 7000	7
7000 - 8000	6
8000 - 9000	3
9000 - 10000	1
10000 - 11000	1

Solution:-

the class (4000 - 5000) $f_1 = 18$

$$f_0 = 4$$

$$f_2 = 9$$

$$h = 5000 - 4000 = 1000$$

$$L = 4000$$

$$\text{Mode} = 4000 + \left(\frac{18 - 4}{2(18) - 4 - 9} \right) \times 1000$$

$$= 4000 + \left(\frac{14}{23} \right) \times 1000$$

$$\text{Mode} = 4608.69$$