BBA 203
Weighted Average Mean

- Weighted Mean is an average computed by giving different weights to some of the individual values. If all the weights are equal, then the weighted mean is the same as the arithmetic mean.

- It represents the average of a given data. The Weighted mean is similar to arithmetic mean or sample mean. The Weighted mean is calculated when data is given in a different way compared to an arithmetic mean or sample mean.

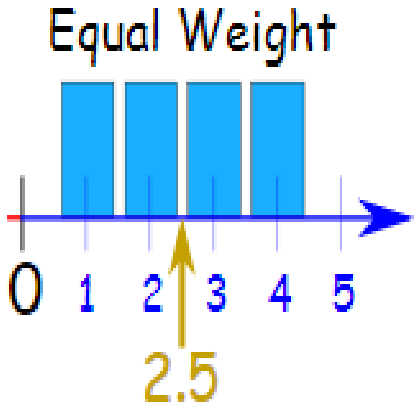
- Whereas weighted means generally behave in a similar approach to arithmetic means, they do have a few counter-instinctive properties. Data elements with a high weight contribute more to the weighted mean than do elements with a low weight.

- The weights cannot be negative. Some may be zero, but not all of them; since division by zero is not allowed. Weighted means play an important role in the systems of data analysis.

Mean

When we do a simple mean (or average), we give equal weight to each number.

Here is the mean of 1, 2, 3 and 4:



Add up the numbers, divide by how many numbers:

$$\text{Mean} = \frac{1 + 2 + 3 + 4}{4} = \frac{10}{4} = 2.5$$

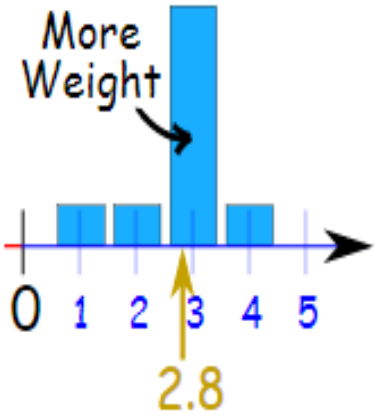
Weights

We could think that each of those numbers has a "weight" of ¼ (because there are 4 numbers):

$$\text{Mean} = \tfrac{1}{4} \times 1 + \tfrac{1}{4} \times 2 + \tfrac{1}{4} \times 3 + \tfrac{1}{4} \times 4$$
$$= 0.25 + 0.5 + 0.75 + 1 = \mathbf{2.5}$$

Same answer.

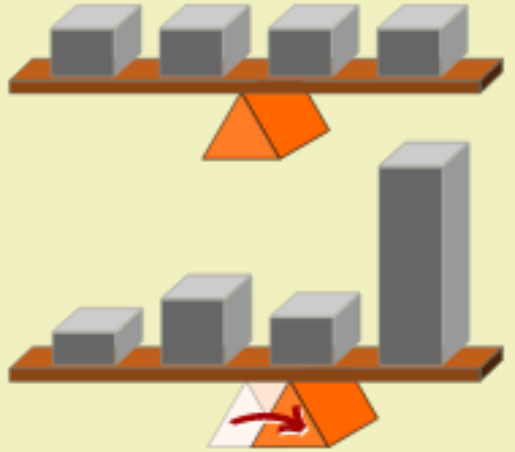
Now let's change the weight of **3** to 0.7, and the weights of the other numbers to 0.1 so **the total of the weights is still 1**:



$$\text{Mean} = 0.1 \times 1 + 0.1 \times 2 + 0.7 \times 3 + 0.1 \times 4$$
$$= 0.1 + 0.2 + 2.1 + 0.4 = \mathbf{2.8}$$

This **weighted mean** is now a little higher ("pulled" there by the weight of 3)

When some values get more weight than others, the central point (the mean) can change:



- **w** for the number of weeks (the weight)
- **x** for days (the value we want the mean of)

Multiply **w** by **x**, sum up **w** and sum up **wx**:

Weight w	Days x	wx
2	1	2
14	2	28
8	5	40
32	7	224
Σw = 56		Σwx = 294

Note: Σ (Sigma) means "Sum Up"

Divide **Σwx** by **Σw**:

$$\text{Mean} = \frac{294}{56} = 5.25$$

Calculate a students class average based on the following grades.

Component	Percent, w	Grade, x
Test 1	15%	84
Test 2	15%	89
Test 3	15%	55
Web based Homework Assignments	20%	100
Project	10%	100
Final	25%	82

$$\bar{X} = \frac{\sum (w \cdot x)}{\sum w}$$

← Create a column for $w \cdot x$

Calculate a students class average based on the following grades.

Component	Percent, w	Grade, x	$w \cdot x$
Test 1	15%	84	15(84) = 1260
Test 2	15%	89	15(89) = 1335
Test 3	15%	55	15(55) = 825
Web based Homework Assignments	20%	100	20(100) = 2000
Project	10%	100	10(100) = 1000
Final	25%	82	25(82) = 2050

$$\Sigma w = 100 \qquad \Sigma(w \cdot x) = 8470$$

$$\overline{X} = \frac{\sum(w \cdot x)}{\sum w} = \frac{8470}{100} = 84.7$$

A student obtained the marks 40, 50, 60, 80, and 45 in math, statistics, physics, chemistry and biology respectively. Assuming weights 5, 2, 4, 3, and 1 respectively for the above mentioned subjects, find the weighted arithmetic mean per subject.