Example 3.1 The weights (in kg) of 6 persons in a firm are 64, 66, 63, 69, 75, and 68. Find their mean.

Solution: Let x denote the weight. So the mean of x is

$$\bar{x} = \frac{64+66+63+69+75+68}{6} = \frac{405}{6} = 67.5 \text{ (kg)}.$$

The computation of the arithmetic mean, in some cases, is simplified by subtracting a suitable factor c, say, from each observation.

Suppose $y_i = x_i - c$ for each i,

or $\sum_{i=1}^{n} y_i = \sum_{i=1}^{n} (x_i - c)$, where n denotes the number of given values.

or, $\frac{\sum y_i}{n} = \frac{\sum x_i}{n} - \frac{nc}{n}$

or, $\bar{y} = \bar{x} - c$ or $\bar{x} = \bar{y} + c$

Example 3.2. The profit (in Rs.) of a grocer on 7 days of a week are 205, 221, ~~220~~ 210, 230, 218, 204, 217. Find the mean profit per day.

Solution: Suppose x denotes the daily profit of the grocer and $x_1, x_2, \ldots, x_7$ are the given values of x for 7 days.

Let $y_i = x_i - 200$, for each $i = 1, 2, \ldots, 7$.

Here $y_1, y_2, y_3, y_4, y_5, y_6$ and y_7 are

5, 21, 10, 30, 18, 4, ~~17~~ and 17 respectively.

Then $\bar{y} = \dfrac{5+21+10+30+18+4+17}{7} = \dfrac{105}{7} = 15$

Finally $\bar{x} = \bar{y} + 200 = 215$ (Rs.)

If the values of a discrete variable are exhibited alongwith their corresponding frequencies, then the mean can be obtained in the following way: $\bar{x} = \dfrac{f_1x_1 + f_2x_2 + \dots + f_rx_r}{f_1+f_2+\dots+f_r} = \dfrac{\sum_{i=1}^{r} f_i x_i}{n}$ ... Eq(3.3)

where $x_1, x_2, \dots, x_r$ denote the distinct values of the variable x and $f_1, f_2, \dots, f_r$ indicate their respective frequencies and $n = \sum_{i=1}^{r} f_i$

Example 3.3.

The number of letters (i.e. word-length) in each of 40 words were counted and the following frequency ~~table~~ distribution was ~~form~~ formed:

Word length x	Number of words f
2	6
3	8
4	12
5	10
7	4
Total	40

Calculate the mean of the above distribution

Solution: To find the mean of x, we calculate $f_i x_i$ values for each i, which are 12, 24, 48, 50 and 28.

Hence $\bar{x} = \dfrac{\sum_i f_i x_i}{n} = \dfrac{12+24+48+50+28}{40} = \dfrac{162}{40} = 4.05$,

Since $n = \sum_i f_i = 40$

Again, for a continuous variable, the data are summarised in a frequency table showing the various class intervals and their corresponding class ~~frequency~~ frequencies. In this case, the class mark of a class interval is supposed to represent the interval and on the basis of this assumption, the approximate value of the mean may be obtained. Here the mean $(\bar{x})$ is expressed in the form

$$\bar{x} = \frac{\sum_{i=1}^{r} f_i x_i}{\sum_{i=1}^{r} f_i} = \frac{\sum_{i=1}^{r} f_i x_i}{n} \quad \cdots (3c)$$

where $x_1, x_2, \ldots, x_r$ represent the class marks of r class intervals and $f_1, f_2, \ldots, f_r$ denote the corresponding class frequencies.

In the case of equal width the class intervals, Calculation of mean ~~A~~ may be facilitated through a change of origin (or base) and scale. We are to subtract c from each class mark and then divide the resultant by d, where c is the chosen origin, usually a class mark near the middle of the range, and d, the scale, is the common width. If y_i be the new value corresponding to x_i, then

$$y_i = \frac{x_i - c}{d} \quad \text{or, } x_i = c + dy_i \text{, for each } i$$

$$\text{or, } f_i x_i = cf_i + df_i y_i \quad \text{for each } i$$

$$\text{or, } \sum f_i x_i = c \sum f_i + d \sum f_i y_i$$

$$\text{or, } \frac{1}{n} \sum f_i x_i = c + \frac{d}{n} \sum f_i y_i \quad \text{where } n = \sum f_i$$

$$\text{or, } \bar{x} = c + d\bar{y} \quad (3d)$$

Example 3.4 Calculate the mean of the following frequency distribution:

class interval	1-3	4-6	7-11	12-16	17-19	20-22
Frequency	4	6	12	10	5	3

Solution:

Table 3.1

NECESSARY CALCULATION FOR MEAN

class-interval	Frequency (f_i)	Class marks (x_i)	$f_i x_i$
1-3	4	2	8
4-6	6	5	30
7-11	12	9	108
12-16	10	14	140
17-19	5	18	90
20-22	3	21	63
Total	40	—	439