

Where:

\bar{X}_1 = first raw score

\bar{X}_2 = second raw score

\bar{X}_3 = third raw score

\bar{X}_n = nth raw score

Σ = summation or sum of scores

N = number of subjects in the distribution

The mean may be conceptualized as a center of gravity or balance point in which the scores, or weights, on one side exactly balance the scores or weights on the other side. Each weight represents a score from a distribution of scores. The arithmetic mean of all the scores or weights is the center of gravity or balance point. The deviation of scores in one direction exactly equals the deviation of scores in the other direction.

8.5.9.3.1 Calculating the Mean for Raw or Ungrouped Data

The mean is readily calculated for a distribution of raw scores in which each score occurs only once. The mean is simply the sum of the raw scores divided by the number of scores. For example, consider the following distribution of eight scores:

3, 6, 7, 8, 11, 15, 16, 22

$\Sigma X = 88$

$N = 8$

$\bar{X} = \Sigma X / N$

$= (3 + 6 + 7 + 8 + 11 + 15 + 16 + 22) / 8$

$= 88 / 8$

$= 11.0$

The mean or average value is calculated as 11.0.

For ungrouped data with a small sample of scores, the previous procedure may be used to calculate the mean. Alternatively, for grouped data, a frequency distribution should be set up. Then the mean is calculated from the frequency distribution table by multiplying each score by the frequency of occurrence and summing the total across all scores before dividing by the total number of scores.

In the following example, several scores occur more than once:

2, 3, 3, 4, 5, 5, 6, 6, 6, 7, 8, 8, 9, 9

Step 1. The first stage in computing the mean is to form a frequency distribution table.

| X | f | fX |
|---|---|--------------------|
| 2 | 1 | 2 |
| 3 | 2 | 6 |
| 4 | 1 | 4 |
| 5 | 2 | 10 |
| 6 | 3 | 18 |
| 7 | 1 | 7 |
| 8 | 2 | 16 |
| 9 | 3 | 27 |
| | | $\Sigma (fX = 90)$ |

The number in the third column is obtained by multiplying each raw score by the frequency of occurrence. The symbol fX represents the product of the scores multiplied by the frequency of scores. This column is then summed and divided by the total number of scores—in this example, 15 scores.

$$\bar{X} = \Sigma fX / N$$

So:

$$\Sigma fX = 90$$

$$N = 15$$

$$= 90 / 15$$

$$= 6.0$$

8.5.9.3.2 Calculating the Mean for Grouped Data

When working with grouped data, first find the midpoint of each score interval before calculating the mean.

The general formula to determine the mean for grouped data is

$$\bar{X} = \Sigma fX / N$$

As an example, consider the following scores grouped into six class intervals:

| CI | Midpoint (X) | f | fX |
|----------|--------------|-----------------|-------------------|
| 3 to 5 | 4 | 2 | 8 |
| 6 to 8 | 7 | 1 | 7 |
| 9 to 11 | 10 | 4 | 40 |
| 12 to 14 | 13 | 6 | 78 |
| 15 to 17 | 16 | 3 | 48 |
| 18 to 20 | 19 | 4 | 76 |
| | | $\Sigma f = 20$ | $\Sigma fX = 257$ |

Therefore,

$$\bar{X} = 257 / 20$$

$$\bar{X} = 12.85$$