

Summation

Notation:

$$\sum_{i=1}^n x_i = x_1 + x_2 + x_3 + \cdots + x_n$$

Σ is a Greek letter sigma, this is an instruction to find the sum.

i is the index of the sum, it tells where to start the sum and where to end it.

$\sum_{i=1}^n x_i$ is to add the terms x_i , starting with $i = 1$, and ending with $i = n$.

Example: Compute the following.

1. $\sum_{i=1}^4 i = 1 + 2 + 3 + 4 = 10$

2. $\sum_{i=1}^4 i^2 = 1^2 + 2^2 + 3^2 + 4^2 = 30$

Exercises:

Compute the following summations.

1. $\sum_{i=1}^8 i$

2. $\sum_{i=1}^{10} i^2$

3. $\sum_{i=1}^6 5i$

4. $\sum_{i=1}^4 (10 - i)^2$

In many statistics books, the index is often omitted.

$\sum x$: sum of all x values.

Example: Given a data set:

3, 2, 5, 9, 11

a. Find $\sum x$

$$\sum x = 3 + 2 + 5 + 9 + 11 = 30$$

b. Find $\sum x^2$

$$\sum x^2 = 3^2 + 2^2 + 5^2 + 9^2 + 11^2 = 240$$

c. Find $\frac{\sum x}{6}$

$$\frac{\sum x}{5} = \frac{30}{5} = 6$$

d. Find $\sum (x - 6)^2$

$$\sum (x - 6)^2 = (3 - 6)^2 + (2 - 6)^2 + (5 - 6)^2 + (9 - 6)^2 + (11 - 6)^2 = 60$$

Exercises:

Answer the following question using the given data

12 10 9 7 13 18 14 11 9 7

5. Find $\sum x$

6. Find $\sum x^2$

7. Find $(\sum x)^2$

8. Find $\sum (x - 11)^2$