# Day 1: Standard Deviation

HackerRank

**Objective**
In this challenge, we practice calculating *standard deviation*. Check out the *Tutorial* tab for learning materials and an instructional video!

**Task**
Given an array, $X$, of $N$ integers, calculate and print the standard deviation. Your answer should be in decimal form, rounded to a scale of $1$ decimal place (i.e., $12.3$ format). An error margin of $\pm 0.1$ will be tolerated for the standard deviation.

**Input Format**

The first line contains an integer, $N$, denoting the number of elements in the array.
The second line contains $N$ space-separated integers describing the respective elements of the array.

**Constraints**

- $5 \leq N \leq 100$
- $0 < x_i \leq 10^5$, where $x_i$ is the $i^{th}$ element of array $X$.

**Output Format**

Print the *standard deviation* on a new line, rounded to a scale of $1$ decimal place (i.e., $12.3$ format).

**Sample Input**

```
5
10 40 30 50 20
```

**Sample Output**

```
14.1
```

**Explanation**

First, we find the *mean*:

$$\mu = \frac{\sum_{i=0}^{N-1} x_i}{N} = 30.0$$

Next, we calculate the squared distance from the mean, $(x_i - \mu)^2$, for each $x_i$:

1. $(x_0 - \mu)^2 = (10 - 30)^2 = 400$
2. $(x_1 - \mu)^2 = (40 - 30)^2 = 100$
3. $(x_2 - \mu)^2 = (30 - 30)^2 = 0$
4. $(x_3 - \mu)^2 = (50 - 30)^2 = 400$

5. $\left(x_4 - \mu\right)^2 = (20 - 30)^2 = 100$

Now we can compute $\sum_{i=0}^{N-1} \left(x_i - \mu\right)^2 = 400 + 100 + 0 + 400 + 100 = 1000$, so:

$$\sigma = \sqrt{\frac{\sum_{i=0}^{N-1} \left(x_i - \mu\right)^2}{N}} = \sqrt{\frac{1000}{5}} = \sqrt{200} = 14.1421356$$

Once rounded to a scale of $1$ decimal place, our result is $14.1$.