7011 Security System

Nowaday, many companies provide softwares and services via networks. They maintain servers to keep softwares and user records. Users can download softwares or send requests for further services. For these companies, having a security system to detect and block intrusions into servers is necessary. Therefore, how to build a security system is a very important and practical issue.

Joe is asked to construct a new security system. During the construction, he encounters a problem as follows. Given a nonnegative integer α and a sequence $S = (s_1, s_2, \ldots, s_n)$ of n nonnegative integers, find a *best* sequence $T = (t_1, t_2, \ldots, t_n)$ of n nonnegative real numbers satisfying the following two properties:

(1) The sequence T is nondecreasing (i.e., $t_1 \le t_2 \le \ldots \le t_n$).

(2) For $2 \le i \le n$, the difference between t_{i-1} and t_i is bounded by α (i.e., $t_i - t_{i-1} \le \alpha$).

Let R^n be the set of all possible sequences that satisfy the above two properties. To determine which sequence in R^n is the *best* one, define the *distance* between S and a sequence $T \in R^n$ to be $d(S,T) = \sum_{1 \le i \le n} (t_i - s_i)^2$. The best sequence T is the sequence in R^n having the minimum distance from S.

In Joe's application, α and the numbers in the sequence S are integers between 0 and 10000. He has observed (and proved) that the numbers in the best sequence T are all rational numbers ≤ 10000.

Consider a simple example in which $n = 2$, $\alpha = 5$, and $S = (0, 10)$. It is easy to see that the best sequence T is (5/2, 15/2). Consider a more complicated example in which $n = 4$, $\alpha = 270$, and $S = (180, 450, 60, 980)$. Let $A = (307/3, 1112/3, 1369/3, 2099/3)$, $B = (180, 1220/3, 1220/3, 2030/3)$, $C = (1880/3, 690, 655, 900)$, and $D = (300, 620, 1677/2, 970)$. Both A and B are in the set R^4. However, since $c_3 < c_2$ and $d_2 - d_1 > 270$, C and D are not in the set R^4. We have $d(S,A) = (307/3 - 180)^2 + (1112/3 - 450)^2 + (1369/3 - 60)^2 + (2099/3 - 980)^2 = 2231935/9$ and $d(S,B) = (180 - 180)^2 + (1220/3 - 450)^2 + (1220/3 - 60)^2 + (2030/3 - 980)^2 = 642200/3$. In this example, since $d(S,B) < d(S,A)$, B is better than A. Actually, B is the best sequence, since it has the minimum distance from S among all sequences in R^4.

To compute the distance between S and the best sequence T, for $1 \le k \le n$, Joe defines a function f_k as follows: for any real number $x \in [0, 10000]$, $f_k(x)$ is the minimum distance from $(s_1, s_2, \ldots, s_k)$ to a sequence $(t_1, t_2, \ldots, t_k)$ with $t_k = x$ in R^k. For example, $f_3(100.5)$ is the minimum distance from (s_1, s_2, s_3) to a sequence $(t_1, t_2, 100.5) \in R^3$. Note that $f_1(x) = (x - s_1)^2$. By definition, if the function f_n is computed, the minimum distance $d(S,T)$ equals the minimum of $f_n(x)$, where $0 \le x \le 10000$. Joe has observed (and proven) the following, which may be useful to the computation of f_n.

Fact 1. For each k, $1 \le k \le n$, as the x-value increases, the function value of $f_k(x)$ decreases to a minimum value and then increases.

Please write a program to compute the minimum distance $d(S,T)$.

Technical Specification

- The size n of S is an integer between 1 and 15.
- The number α is an integer between 0 and 10000.
- Each number s_i in the sequence S is an integer between 0 and 10000.

- To avoid overflow, we use a 3-tuple (a, b, c) of 64-bit integers to represent a rational number r in a mixed-number form as follows: (1) a is the integer part of r; (2) b/c is the fractional part of r; and (3) b and c are nonnegative and are relatively prime. For example, consider that $r = 642200/3$. Since its integer and fractional parts are, respectively, 214066 and 2/3, we use (214066, 2, 3) to represent r. As another example, we use $(-3, 1, 2)$ to represent $r = -2.5$. In case r is an integer, set $b = 0$ and $c = 1$.

Input

The first line contains an integer $k \leq 100$ indicating the number of test cases. Each case consists of two lines. The first line contains the integer n and the integer α. The second line contains the sequence $S = (s_1, s_2, \ldots, s_n)$.

Output

For each test case, output three nonnegative integers a, b, c in one line, where $a + b/c$ is the distance between S and the best sequence T. To ensure uniqueness of the answer, use the format specified in Technical Specification.

Sample Input

```
3
2 5
0 10
4 270
180 450 60 980
3 200
800 590 1000
```

Sample Output

```
12 1 2
214066 2 3
29400 0 1
```