Problem F. Double 11

Time limit: 6 seconds
Memory limit: 1024 megabytes

With the Double 11 Shopping Festival approaching, a store is managing its best-selling products for the event.

There are n types of best-selling products, and the daily sales volume for each type is s_i. Products need to be replenished multiple times to meet sales demand, and due to limited warehouse space, the total inventory must not exceed the storage capacity.

If only one type of product is replenished at a time, the workload becomes too high. To optimize replenishment, the store decides to divide the product types into m groups, assigning a replenishment parameter to each group. For group j, the replenishment parameter k_j is a positive real number, which means for each product type i in this group, a volume of $k_j \cdot s_i$ will be prepared for each replenishment, and it will be replenished $\frac{1}{k_j}$ times per day on average. Note that k_j can be either greater than, less than or equal to 1.

Let c_i be the group index of product type i. The maximum inventory in the warehouse can be represented by $\sum_{i=1}^{n} k_{c_i} \cdot s_i$. Due to the warehouse capacity limitation, this value cannot exceed 1.

Your task is to find a scheme that divides the n product types into m groups and assigns a replenishment parameter to each group such that the total number of replenishments per day is minimized while satisfying the warehouse capacity limitation, i.e., minimize $\sum_{i=1}^{n} \frac{1}{k_{c_i}}$, subject to $\sum_{i=1}^{n} k_{c_i} \cdot s_i \le 1$. For convenience, you should output the square root of the minimal answer, i.e., $\sqrt{\sum_{i=1}^{n} \frac{1}{k_{c_i}}}$. Note that you can assign the same replenishment parameters to different groups.

Input

The first line contains two integers n and m ($1 \le m \le n \le 2 \cdot 10^5$), indicating the number of product types and the number of groups.

The second line contains n integers s_i ($1 \le s_i \le 10^5$), indicating the sales volume of product type i.

Output

Output one real number, indicating the answer. Your output will be considered correct if the relative or absolute error does not exceed 10^{-9}.

Examples

standard input	standard output
4 2 1 2 3 4	6.1911471295571
10 3 1 2 3 4 5 6 7 8 9 10	22.5916253665141

Note

For the first example, let $k_1 = \frac{1}{3+\sqrt{21}}, k_2 = \frac{1}{7+\sqrt{21}}$, and $c_1 = c_2 = 1, c_3 = c_4 = 2$. We will get the maximum inventory as $(1+2)k_1 + (3+4)k_2 = 1$, and the total number of replenishments is $\frac{2}{k_1} + \frac{2}{k_2} = 20 + 4\sqrt{21}$. Therefore, the answer is $\sqrt{20+4\sqrt{21}} \approx 6.1911471295571$, which is the minimum.