Keeping Rabbits

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1.5 seconds
Memory limit:	512 megabytes

DreamGrid is the keeper of n rabbits. Initially, the i-th ($1 \le i \le n$) rabbit has a weight of w_i.

Every morning, DreamGrid gives the rabbits a carrot of weight 1 and the rabbits fight for the only carrot. Only one rabbit wins the fight and eats the carrot. After that, the winner's weight increases by 1. The whole process of fighting and eating ends before the next morning.

DreamGrid finds that the heavier a rabbit is, the easier it is to win a fight. Formally, if the weights of the rabbits are $w'_1, w'_2, \ldots, w'_n$ before a fight, the probability that the i-th rabbit wins the fight is

$$\frac{w'_i}{\sum_{j=1}^{n} w'_j}$$

He wants to know the expected weight of every rabbit after k days (k carrots are given and eaten).

Input

The input contains multiple cases. The first line of the input contains a single integer T ($1 \le T \le 10^5$), the number of cases.

For each case, the first line of the input contains two integers n and k ($1 \le n \le 10^5, 1 \le k \le 10^9$). The second line contains n integers $w_1, w_2, \ldots, w_n$ ($1 \le i \le n, 1 \le w_i \le 10^9$).

It's guaranteed that the sum of n over all cases doesn't exceed 10^6.

Output

For each case, print a single line containing n space-separated real numbers, where the i-th ($1 \le i \le n$) number should be equal to the expected weight of the i-th rabbit after k days.

Your answer will be considered correct if the absolute or relative error does not exceed 10^{-4}.

Example

standard input	standard output
3 1 1 2 2 2 1 3 3 2 1 1 1	3.00000000 1.50000000 4.50000000 1.66666667 1.66666667 1.66666667