

Tree Planting (prob9)

The Problem

You are the owner of an apple orchard, and you are trying to figure out the best locations to plant your apple trees. On this orchard, there are N rows where you can plant T apple trees. Orchard row i has width w_i and a tree can be planted on row i in any location in the range $[0, w_i]$.

For planting the trees, you want them to have enough space so that each tree has proper access to soil nutrients and sunlight. If they are planted too close to another tree (or to the end of a row), then they may not receive enough nutrients and sunlight to survive. Define the spacing of a tree to be the minimum of

- 1) the distance of this tree to another tree in the same row
- 2) the distance of this tree to either end of its row

The spacing of the entire planting is then the minimum spacing over all trees. We assume that there is adequate spacing between the orchard rows so that trees in separate rows do not compete for nutrients or sunlight. The objective of this problem is to determine the maximum spacing for a planting, given a set of rows and number of trees. The bigger the spacing, the better chance that all the trees survive!

Input

The first line of input is a number t , specifying the number of test cases. For each test case, the first line will be two integers, N and T , where $1 \leq N \leq 10^6$ and $1 \leq T \leq 10^9$. On the second line, N numbers follow, specifying the width of each orchard row to 1 decimal place. The width of each row is at most 10^6 .

Output

For each test case, print the maximum spacing achievable for a planting, rounded to 3 decimal places. Each test case should be followed by a newline character.

Sample Input	Sample Output
2	1.000
1 3	1.375
4.0	
2 4	
3.0 5.5	