Playing Go

Input file:	`standard input`
Output file:	`standard output`
Time limit:	4 seconds
Memory limit:	1024 megabytes

Given n points on a plane. Some of them are white, and some are black. No two points coincide. No three points lie on the same line.

You are required to move one of the white points a distance of $\leq r$ in such a way as to maximize the area of the convex hull of the set of points that you will have after this operation.

Input

Each test consists of several test cases. The first line contains a single integer t ($1 \leq t \leq 1\,000$) — the number of test cases. The description of the test cases follows.

The first line of each test case contains two integers n and r ($3 \leq n \leq 2\,000$, $1 \leq r \leq 10^9$) — the number of points and the maximum distance for moving a point.

The next n lines describe the points. The i-th line contains three integers x_i, y_i, and c_i ($-10^9 \leq x_i, y_i \leq 10^9$, $1 \leq c_i \leq 2$) — the coordinates and color of point i (1 — white, 2 — black).

It is guaranteed that the sum of n over all test cases in each test does not exceed $2\,000$.

Output

For each test case, output a single number on a separate line — the maximum area of the convex hull of this set of points, if any of the white points can be moved by no more than r.

Your answer will be considered correct if its absolute or relative error does not exceed 10^{-6}.

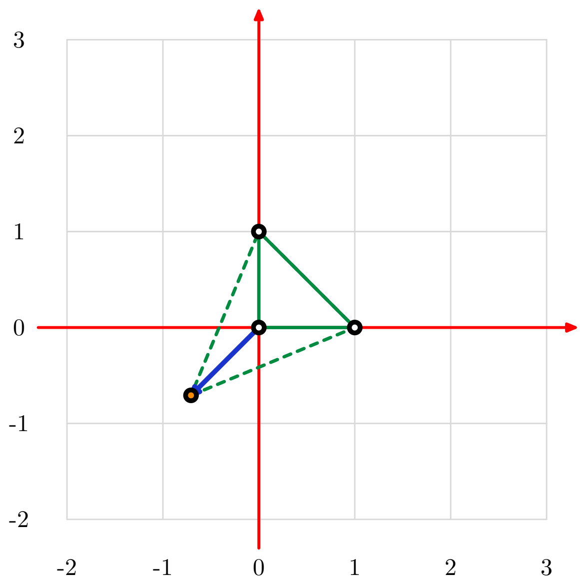
Formally, let your answer be a, and the jury's answer be b. Your answer will be accepted if and only if $\frac{|a-b|}{\max(1,|b|)} \leq 10^{-6}$.

Examples

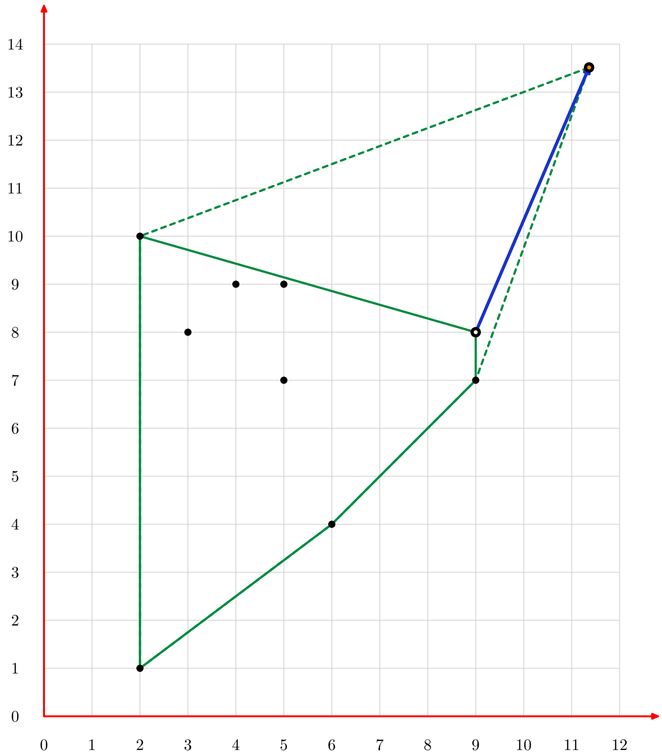
standard input	standard output
1 3 1 0 0 1 1 0 1 0 1 1	1.207106781186547
1 9 6 2 10 2 5 7 2 9 8 1 6 4 2 4 9 2 2 1 2 9 7 2 5 9 2 3 8 2	59.347319317591726
1 9 1 8 7 1 1 9 1 3 9 1 4 2 1 7 4 1 10 5 1 3 7 1 4 4 1 7 6 1	37.424428900898050

Note

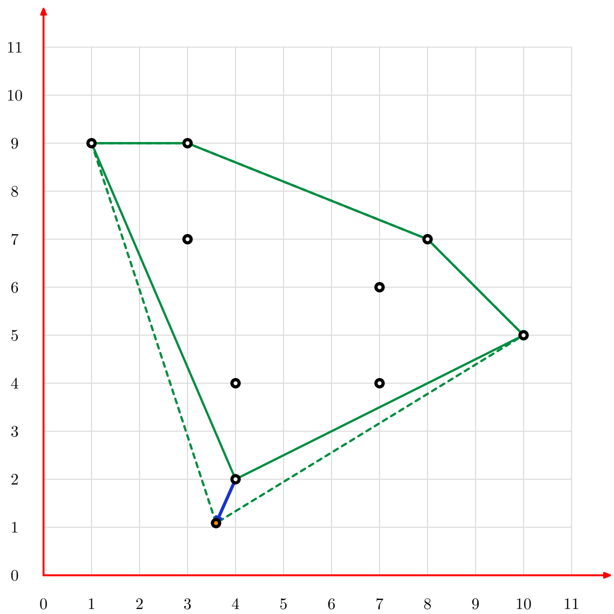
Below are images for the examples from the statement. The dashed line indicates the edges of the new convex hull, the solid line indicates the edges of the old convex hull and the common edges. The blue arrow shows the optimal movement of the white point.



Example 1



Example 2



Example 3

Scoring

The tests for this problem consist of nine groups. Points for each group are awarded only if all tests in the group and all tests in some of the previous groups are passed. Note that passing the tests from the statement may not be required for some groups. **Offline checking** means that the results of testing your solution on this group will only be available after the competition ends.

Let $\sum n$ be the sum of n over all test cases of this test.

Group	Points	Constraints	Required	Comment
		$\sum n$		
0	0	–	–	Samples
1	11	$\sum n \leq 3$	0	
2	18	$\sum n \leq 30$	0, 1	
3	6	$\sum n \leq 50$	0, 1, 2	
4	13	$\sum n \leq 200$	–	All points on the convex hull are black
5	14	$\sum n \leq 200$	0 – 4	
6	8	$\sum n \leq 500$	4	All points on the convex hull are black
7	7	$\sum n \leq 500$	0 – 6	
8	12	$\sum n \leq 2000$	4, 6	All points on the convex hull are black. **Offline checking**
9	11	$\sum n \leq 2000$	0 – 8	**Offline checking**