7510 Convex Polyhedron

Harold lives on the Tropic of Cancer, and he just noticed that the sun was directly overhead, which is very rare! He was so excited that he took out one of his toys, which was a convex polyhedron, and started playing with it. The sun shone down on the toy and made a shadow of the toy on the flat ground. Harold found that as he rotated the toy in three-dimensional space, the area of the shadow might change. He wondered what the maximal area of this shadow could be.

More formally: given a convex polyhedron, find out the maximal possible area of its projection onto a plane. According to Wikipedia, a convex polyhedron is a three-dimensional solid with flat polygonal faces, straight edges, and sharp corners or vertices, for which the surface (comprising its faces, edges and vertices) does not intersect itself and the line segment joining any two points of the polyhedron is contained in the interior or surface.

Input

The first line of the input gives the number of test cases, T, and is followed by a blank line.

T test cases follow. Each test case starts with one line with an integer N, the number of points on the convex polyhedron. N more lines follow; each line consists of 3 real numbers, X_i, Y_i, and Z_i, representing the coordinates in 3-dimensional space of the i-th point of the convex polyhedron. All of these points will be different.

Output

For each test case, output one line containing '`Case #`x`:` y', where x is the test case number (starting from 1) and y is the maximal area of the projection. y will be considered correct if it is within an absolute or relative error of 10^{-6} of the correct answer.

Limits:

- $1 \leq T \leq 100$.
- $4 \leq N \leq 50$.
- All X_i, Y_i, and Z_i will be between -10^9 and 10^9, inclusive.
- The points are guaranteed to form a convex polyhedron.
- There isn't a plane that contains all the points.

Sample Input

```
1

4
0.0 0.0 0.0
0.0 0.0 1.0
0.0 1.0 0.0
1.0 0.0 0.0
```

Sample Output

```
Case #1: 0.8660254038
```