Submissions

Square Counting

8pt	Not attempted **1423/2010 users** correct (71%)
17pt	Not attempted **524/1333 users** correct (39%)

Patterns Overlap

13pt	Not attempted **394/1100 users** correct (36%)
22pt	Not attempted **287/364 users** correct (79%)

Space Cubes

14pt	Not attempted **252/395 users** correct (64%)
26pt	Not attempted **100/119 users** correct (84%)

Top Scores

Doju	100
phirasit	100
jerrymao	100
globalpointer	100
Kasugano.Sora	100
alecsyde	100
FatalEagle	100
xwchow	100
iskim	100
wifi	100

Problem C. **Space Cubes**

This contest is open for practice. You can try every problem as many times as you like, though we won't keep track of which problems you solve. Read the Quick-Start Guide to get started.

Small input 14 points	Solve C-small
Large input 26 points	Solve C-large

Problem

"Look at the stars, look how they shine for you." - Coldplay, "Yellow"

In a galaxy far, far away, there are many stars. Each one is a sphere with a certain position (in three-dimensional space) and radius. It is possible for stars to overlap each other.

The stars are so incredibly beautiful to you that you want to capture them forever! You would like to build two cubes of the same integer edge length, and place them in space such that for each star, there is at least one cube that *completely* contains it. (It's not enough for a star to be completely contained by the union of the two cubes.) A star is completely contained by a cube if no point on the star is outside the cube; a point exactly on a cube face is still considered to be inside the cube.

The cubes can be placed anywhere in space, but they must be placed with their edges parallel to the coordinate axes. It is acceptable for the cubes to overlap stars or each other.

What is the minimum integer edge length that allows you to achieve this goal?

Input

The input starts with one line containing exactly one integer **T**, which is the number of test cases. **T** test cases follow.

Each test case begins with a line containing an integer, **N**, representing the number of stars.

This is followed by **N** lines. On the ith line, there are 4 space-separated integers, $\mathbf{X_i}$, $\mathbf{Y_i}$, $\mathbf{Z_i}$ and $\mathbf{R_i}$, indicating the (X, Y, Z) coordinates of the center of the $\mathbf{i^{th}}$ star, and the radius of the $\mathbf{i^{th}}$ star.

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 minimum cube edge length that solves the problem, as described above.

Limits

$1 \le \mathbf{T} \le 100$.
$-10^8 \le \mathbf{X_i} \le 10^8$, for all i.
$-10^8 \le \mathbf{Y_i} \le 10^8$, for all i.
$-10^8 \le \mathbf{Z_i} \le 10^8$, for all i.
$1 \le \mathbf{R_i} \le 10^8$, for all i.

Small dataset

$1 \le \mathbf{N} \le 16$.

Large dataset

$1 \le \mathbf{N} \le 2000$.

Sample

Input	Output
3 3 1 1 1 1 2 2 2 1 4 4 4 1 3 1 1 1 2 2 3 4 1 5 6 7 1 3	Case #1: 3 Case #2: 5 Case #3: 2

```
1 1 1 1
1 1 1 1
9 9 9 1
```

In the first test case, one solution is to place two cubes with an edge length of 3 such that their corners with minimum (x, y, z) coordinates are at (0, 0, 0) and (3, 3, 3).
In the second test case, one solution is to place two cubes with an edge length of 5 such that their corners with minimum (x, y, z) coordinates are at (-1, -1, -1) and (1, 2, 3).