Travelling Salesman Problem

The Problem

Given a number of points in a grid, and a starting point, find a solution to the travelling salesman problem (ie. a path that starts and ends at a given point and visits every other point only once). Your solution must be a circuit that has a distance within double of the distance of the optimal path.

The Input

The first line contains the number of test cases *T* (*T* <= 50).

The first line of each test case contains a single number *N* (3 <= *N* <= 20) which is the number of points. The following *N* lines contain two numbers *X* and *Y* separated by a space which are the x,y co-ordinates of each point in a grid where (0<= *X,Y* <= 100). The x,y co-ordinates on the *N*th line are the co-ordinates for point *N*-1, so the first line has the co-ordinates for point 0, the next line for point 1 and so on to point *N*-1. Remember the distance between two points (x_a,y_a) and (x_b, y_b) can be calculated by

$$dist = \sqrt{(x_a - x_b)^2 + (y_a - y_b)^2}$$

The Output

For each test case, output the test case number followed by a colon and a space and then a space separated list of the points in the path. The path should start and end with point 0. Following the list of points output an equal sign followed by the length of the path, rounded up to the closest integer (use the ceiling function). See the example output below.

NOTE: Your algorithm may not produce exactly the same path as the example. For the example data, double the optimal path distance (rounded up) is 323, so as long as your algorithm produces a valid path with less than that distance, it is correct.

Sample Input

```
1
4
54 94
0 71
25 44
12 42
```

Sample Output

```
1: 0 2 3 1 0 = 162
```