4037 Racing Route

Write a program to find the longest racing route in Taipei city. We are given a city map of Taipei as in the figure 1 below. All the streets are either horizontal or vertical.

You must find the longest race route in Taipei. A race route is a circle that travels only along the streets of Taipei. When a race car reaches an intersection, it can go through the intersection, or it can make a left turn, or it can make a right turn, but it cannot make an u-turn. A race route must start and end at the same intersection, and it can make at most T turns. We also assume that all the streets in Taipei are two-way. The following figure 2 is a race route that makes eight turns.
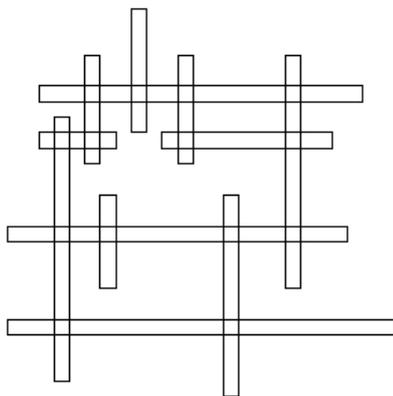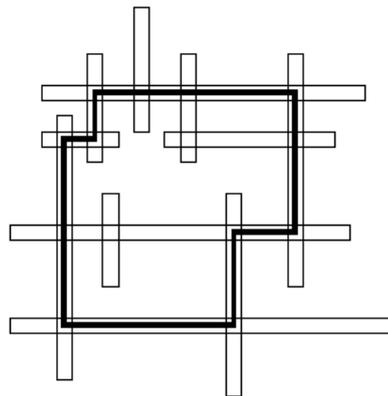

Figure 1: The map of Taipei.   Figure 2: A race route that makes 8 turns.

Now given the locations of all Taipei city streets and the number T, please compute the length of the longest race route that makes at most T turns.

Technical Specification

1. The number of test cases C is no more than 25.

2. The number of turns T is no more than 2147483647.

3. The number of streets E is no more than 20.

4. The x and y coordinates of the street is between -2147483648 and 2147483647, inclusively.

Input

The first line of the input file contains an integer C indicating the number of test cases to follow. The first line of an input case has two numbers — T for the number of turns and E for the number of streets. Each of the next E lines represents one street with four numbers — the x and y coordinates of the first endpoint and the the x and y coordinates of the second endpoint.

Output

There will be C lines of output. Each line has the length of the longest race route that makes at most T turns. If no such route exists, please output '0'.

Sample Input

```
1
8 4
-1 0 2 0
-1 1 5 1
0 -4 0 10
1 8 1 -5
```

Sample Output

```
8
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