Beer Pipes

After a stressful work day, Lea enjoys a nice cold beverage while sitting on her couch in front of the TV. Like most of the people from the region she comes from, she usually enjoys a beer on these occasions. And after having a few sips of the exquisite golden liquid, she contemplates the work that is put behind brewing such a masterpiece. Thus, she decides to visit the **BIER** (**B**rewery of **I**nternational **E**xcellence and **R**elevance), one of the many local breweries, on the next day to learn a bit more about the process behind her favourite beverage. Apart from all the usual brewery tour, she meets Mr. Barley Hops, the CEO of **BIER**. Recognising Lea, he says (in a heavy German accent) "Guten Tag my dear Fräulein Lea. I have heard about you and your problem solving skills, maybe you can help us? The workers installed new pipes for the Bier. They were so drunk, every pipe has a different shape und we don't know how much Bier we can pump into the pipes." Lea immediately sees the problem: the beer is poured into a pipe on one end of the brewery and exits at one valve at the other end in a great cauldron. In between there is a whole system of pipes that are connected in a seemingly chaotic fashion and are all shaped very differently. The question at stake is to come up with the highest amount of beer that can be put through the system so that the beer cauldron at the end is filled with as much beer as possible. Unfortunately, Lea is very busy right now, so she wants you to take a look at the problem. Make sure you can help Mr. Hops because he will grant you a lifetime supply of **BIER** beer if your solution is optimal!

Input

The first line of the input contains an integer t. t test cases follow, each of them separated by a blank line.

Each test case starts with two integers n and m, n being the number of valves $\{v_1, \ldots, v_n\}$ that connect the pipes, and m the number of pipes in the system. m lines follow where line i consists of three integers a_i, b_i and k_i, and a double x_i, denoting that there is a pipe that connects the valves v_{a_i} and v_{b_i} whose cross section has the shape of a regular polygon with k_i sides and side length x_i. If k_i is equal to 0, then the pipe is cylindrical with radius x_i.

The maximal amount of beer that can flow through a pipe is measured by the area of its cross section.

The first valve, where the beer enters the pipe system, is v_1, the exit of the pipe system, at the large beer cauldron, is v_n.

Beer in the pipes can flow in both directions.

Output

For each test case, output one line containing "Case #i: y" where i is its number, starting at 1, and y is either the maximal amount of beer that can be poured into v_1 with an absolute error of up to 10^{-8}, or "impossible" if that amount is 0.

Constraints

- $1 \leq t \leq 20$
- $3 \leq n \leq 1000$
- $1 \leq m \leq 2000$
- $1 \leq a_i, b_i \leq n$ for all $1 \leq i \leq m$
- $3 \leq k_i \leq 20$ or $k_i = 0$ for all $1 \leq i \leq m$
- $1 < x_i \leq 100$ for all $1 \leq i \leq m$

Sample Input 1

```
2
4 5
1 2 0 3.3
1 3 3 1.5
2 3 0 2.2
2 4 5 4.1
3 4 4 2.5

3 2
1 2 0 1.2
1 2 4 2
```

Sample Output 1

```
Case #1: 35.17122510390053
Case #2: impossible
```

Sample Input 2

```
3
7 9
4 1 3 7.1373647190400025
1 2 4 3.619952082374767
7 4 4 3.9229060952100747
1 5 5 5.149342554193151
6 7 0 5.9289433379154115
7 3 3 4.480317767968532
5 7 4 9.175216600972856
3 5 3 5.809582781390198
3 5 6 1.5833251223822389

10 10
9 1 0 6.103567585805486
2 9 4 1.2239623087641212
3 3 3 5.74365487996366
4 3 5 5.509203206150823
5 1 5 4.490092275486687
1 5 3 3.8459000369208165
5 6 0 3.254413686940226
2 1 4 5.257332360634563
1 1 3 3.274553532434247
6 7 4 3.260082839139213

10 5
4 8 5 7.461085908138405
8 10 0 8.000823060758666
8 1 6 4.696393660473783
1 9 6 6.339265904299603
8 3 4 8.535902037766256
```

Sample Output 2

```
Case #1: 61.00890428988396
Case #2: impossible
Case #3: 57.30346357618359
```