**最小生成树问题**

**1312 畅通工程**

Time Limit: 1000 ms

Memory Limit: 256 mb

省政府“畅通工程”的目标是使全省任何两个村庄间都可以实现公路交通（但不一定有直接的公路相连，只要能间接通过公路可达即可）。经过调查评估，得到的统计表中列出了有可能建设公路的若干条道路的成本。现请你编写程序，计算出全省畅通需要的最低成本。

**输入输出格式**

**输入描述:**

测试输入包含若干测试用例。每个测试用例的第1行给出评估的道路条数 N、村庄数目M (N, M < =100 )；随后的 N 行对应村庄间道路的成本，每行给出一对正整数，分别是两个村庄的编号，以及此两村庄间道路的成本（也是正整数）。为简单起见，村庄从1到M编号。当N为0时，全部输入结束，相应的结果不要输出。

**输出描述:**

对每个测试用例，在1行里输出全省畅通需要的最低成本。若统计数据不足以保证畅通，则输出“?”。

**输入输出样例**

**输入样例#:**

3 3

1 2 1

1 3 2

2 3 4

1 3

2 3 2

0 100

**输出样例#:**

3

?

**题目来源**

**浙江大学机试题**

**1311 继续畅通工程**

Time Limit: 1000 ms

Memory Limit: 256 mb

省政府“畅通工程”的目标是使全省任何两个村庄间都可以实现公路交通（但不一定有直接的公路相连，只要能间接通过公路可达即可）。现得到城镇道路统计表，表中列出了任意两城镇间修建道路的费用，以及该道路是否已经修通的状态。现请你编写程序，计算出全省畅通需要的最低成本。

**输入输出格式**

**输入描述:**

测试输入包含若干测试用例。每个测试用例的第1行给出村庄数目N ( 1< N < 100 )；随后的 N(N-1)/2 行对应村庄间道路的成本及修建状态，每行给4个正整数，分别是两个村庄的编号（从1编号到N），此两村庄间道路的成本，以及修建状态：1表示已建，0表示未建。当N为0时输入结束。

**输出描述:**

每个测试用例的输出占一行，输出全省畅通需要的最低成本。

**输入输出样例**

**输入样例#:**

3

1 2 1 0

1 3 2 0

2 3 4 0

3

1 2 1 0

1 3 2 0

2 3 4 1

3

1 2 1 0

1 3 2 1

2 3 4 1

0

**输出样例#:**

3

1

0

**题目来源**

**浙江大学机试题**

**1341 还是畅通工程**

Time Limit: 1000 ms

Memory Limit: 256 mb

某省调查乡村交通状况，得到的统计表中列出了任意两村庄间的距离。省政府“畅通工程”的目标是使全省任何两个村庄间都可以实现公路交通（但不一定有直接的公路相连，只要能间接通过公路可达即可），并要求铺设的公路总长度为最小。请计算最小的公路总长度。

**输入输出格式**

**输入描述:**

测试输入包含若干测试用例。每个测试用例的第1行给出村庄数目N ( < 100 )；随后的N(N-1)/2行对应村庄间的距离，每行给出一对正整数，分别是两个村庄的编号，以及此两村庄间的距离。为简单起见，村庄从1到N编号。当N为0时，输入结束，该用例不被处理。

**输出描述:**

对每个测试用例，在1行里输出最小的公路总长度。

**输入输出样例**

**输入样例#:**

3

1 2 1

1 3 2

2 3 4

4

1 2 1

1 3 4

1 4 1

2 3 3

2 4 2

3 4 5

0

**输出样例#:**

3

5

**题目来源**

**浙江大学机试题**

**1183 Freckles(雀斑)**

Time Limit: 1000 ms

Memory Limit: 32768 mb

In an episode of the Dick Van Dyke show, little Richie connects the freckles on his Dad's back to form a picture of the Liberty Bell. Alas, one of the freckles turns out to be a scar, so his Ripley's engagement falls through.Consider Dick's back to be a plane with freckles at various (x,y) locations. Your job is to tell Richie how to connect the dots so as to minimize the amount of ink used. Richie connects the dots by drawing straight lines between pairs, possibly lifting the pen between lines. When Richie is done there must be a sequence of connected lines from any freckle to any other freckle.

在迪克·范·戴克秀的一集中，小里奇把他爸爸背上的雀斑连起来，组成了一幅自由钟的照片。然而，其中一个雀斑原来是疤痕，所以里奇的行动失败了。将迪克的后背看成一个有雀斑的平面，雀斑分布在不同的(x,y)位置上。你的任务是告诉里奇，应该如何使用最少的墨水连接这些点。里奇通过在两点之间画直线的方式连接一对点。当里奇连接完毕，各雀斑之间都是连通的。

**输入输出格式**

**输入描述:**

The first line contains 0 < n <= 100, the number of freckles on Dick's back. For each freckle, a line follows; each following line contains two real numbers indicating the (x,y) coordinates of the freckle.

输入的第一行是迪克后背上的雀斑数n(0<n<=100)。每个雀斑对应一行，每行包含两个表示雀斑位置坐标的实数(x,y)

**输出描述:**

Your program prints a single real number to two decimal places: the minimum total length of ink lines that can connect all the freckles.

输出将所有雀斑连接起来使用的最少墨水，保留两位小数。

**输入输出样例**

**输入样例#:**

3

1.0 1.0

2.0 2.0

2.0 4.0

**输出样例#:**

3.41

**题目来源**

**北京大学上机题**

**1234 Jungle Roads(林中小路)**

Time Limit: 1000 ms

Memory Limit: 256 mb

The Head Elder of the tropical island of Lagrishan has a problem. A burst of foreign aid money was spent on extra roads between villages some years ago. But the jungle overtakes roads relentlessly, so the large road network is too expensive to maintain. The Council of Elders must choose to stop maintaining some roads. The map above on the left shows all the roads in use now and the cost in aacms per month to maintain them. Of course there needs to be some way to get between all the villages on maintained roads, even if the route is not as short as before. The Chief Elder would like to tell the Council of Elders what would be the smallest amount they could spend in aacms per month to maintain roads that would connect all the villages. The villages are labeled A through I in the maps above. The map on the right shows the roads that could be maintained most cheaply, for 216 aacms per month. Your task is to write a program that will solve such problems.

热带岛屿Lagrishan的长老有一个问题。几年前，一大笔外援资金被花在了村庄之间的额外道路上。但是丛林无情地穿过了道路，因此庞大的路网维护成本太高。长老会必须选择一些道路停止维护。已知现在在使用的道路以及每条道路一个月的维护费用。当然对一些道路停止维护后，所有村庄之间仍应连通。在所有村庄连通的情况下，计算每个月维护道路所需的最少费用。(如果不是连通图的话，最后的结果输出不用包含不在连通图里的那些点)。

**输入输出格式**

**输入描述:**

The input consists of one to 100 data sets, followed by a final line containing only 0. Each data set starts with a line containing only a number n, which is the number of villages, 1 < n < 27, and the villages are labeled with the first n letters of the alphabet, capitalized. Each data set is completed with n-1 lines that start with village labels in alphabetical order. There is no line for the last village. Each line for a village starts with the village label followed by a number, k, of roads from this village to villages with labels later in the alphabet. If k is greater than 0, the line continues with data for each of the k roads. The data for each road is the village label for the other end of the road followed by the monthly maintenance cost in aacms for the road. Maintenance costs will be positive integers less than 100. All data fields in the row are separated by single blanks. The road network will always allow travel between all the villages. The network will never have more than 75 roads. No village will have more than 15 roads going to other villages (before or after in the alphabet). In the sample input below, the first data set goes with the map above.

输入包含1至100个数据集，最后的一个数据集只有一个0.每个数据集的第一行是村庄的数量n(1<n<27)。村庄用字母表的前n个大写字母表示。每个数据集接下来的n-1行按字母表的顺序给出n-1个村庄，村庄的后面给出数字k，k表示从该村庄到在该村庄字母表后面村庄道路的条数。如果k大于0，该行接着给出k条路的信息。

**输出描述:**

The output is one integer per line for each data set: the minimum cost in aacms per month to maintain a road system that connect all the villages. Caution: A brute force solution that examines every possible set of roads will not finish within the one minute time limit.

**输入输出样例**

**输入样例#:**

9

A 2 B 12 I 25

B 3 C 10 H 40 I 8

C 2 D 18 G 55

D 1 E 44

E 2 F 60 G 38

F 0

G 1 H 35

H 1 I 35

3

A 2 B 10 C 40

B 1 C 20

0

**输出样例#:**

216

30

**题目来源**

**北京大学机考题**