Problem A: War on Weather

After an unprovoked hurricane attack on the south shore, Glorious Warrior has declared war on weather. The first salvo in this campaign will be a coordinated pre-emptive attack on as many tropical depressions as possible. GW reckons that the attack will neutralize the tropical depressions before they become storms, and dissuade others from forming.

GW has at his disposal *k* space-to-earth killer satellites at various locations in space. *m* tropical depressions are known to exist at various locations on the earth's surface. Each satellite can attack any number of targets on the earth provided there is *line of sight* between the satellite and each target. How many different targets can be hit?

The input consists of several test cases. Each case begins with a line containing integers *0 < k, m &le 100* as defined above. *k* lines follow, each giving *x,y,z* - the location in space of a satellite at the scheduled time of attack. *m* lines then follow, each giving *x,y,z* - the location of a target tropical depression. Assume the earth is a sphere centred at (0,0,0) with circumference 40,000 km. All targets will be on the surface of the earth (within 10^{-9} km) and all satellites will be at least 50 km above the surface. A line containing 0 0 follows the last test case.

For each test case, output a line giving the total number of targets that can be hit. If a particular target falls within 10^{-8} km of the boundary between being within line-of-sight and not, it may be counted either way. (That is, you need not consider rounding error so long as it does not exceed 10^{-8} km.)

Sample Input

```
3 2
-10.82404031 -1594.10929753 -6239.77925152
692.58497298 -5291.64700245 4116.92402298
3006.49210582 2844.61925179 5274.03201053
2151.03635167 2255.29684503 5551.13972186
-1000.08700886 -4770.25497971 4095.48127333
3 4
0 0 6466.197723676
0 6466.197723676 0
6466.197723676 0 0
6366.197723676 0 0
6365.197723676 112.833485488 0
0 0 6366.197723676
0 -6366.197723676 0
0 0
```

Output for Sample Input

```
2
3
```

Gordon V. Cormack

Problem B: Factstone Benchmark

Amtel has announced that it will release a 128-bit computer chip by 2010, a 256-bit computer by 2020, and so on, continuing its strategy of doubling the word-size every ten years. (Amtel released a 64-bit computer in 2000, a 32-bit computer in 1990, a 16-bit computer in 1980, an 8-bit computer in 1970, and a 4-bit computer, its first, in 1960.)

Amtel will use a new benchmark - the *Factstone* - to advertise the vastly improved capacity of its new chips. The *Factstone* rating is defined to be the largest integer n such that $n!$ can be represented as an unsigned integer in a computer word.

Given a year $1960 \leqslant y \leqslant 2160$, what will be the *Factstone* rating of Amtel's most recently released chip?

There are several test cases. For each test case, there is one line of input containing y. A line containing 0 follows the last test case. For each test case, output a line giving the Factstone rating.

Sample Input

```
1960
1981
0
```

Output for Sample Input

```
3
8
```

Charles L. A. Clarke and Gordon V. Cormack

Problem C: A Walk Through the Forest

Jimmy experiences a lot of stress at work these days, especially since his accident made working difficult. To relax after a hard day, he likes to walk home. To make things even nicer, his office is on one side of a forest, and his house is on the other. A nice walk through the forest, seeing the birds and chipmunks is quite enjoyable.

The forest is beautiful, and Jimmy wants to take a different route everyday. He also wants to get home before dark, so he always takes a path to make progress towards his house. He considers taking a path from *A* to *B* to be progress if there exists a route from *B* to his home that is shorter than any possible route from *A*. Calculate how many different routes through the forest Jimmy might take.

Input

Input contains several test cases followed by a line containing 0. Jimmy has numbered each intersection or joining of paths starting with 1. His office is numbered 1, and his house is numbered 2. The first line of each test case gives the number of intersections N, $1 < N \leq 1000$, and the number of paths M. The following M lines each contain a pair of intersections $a\ b$ and an integer distance $1 \leq d \leq 1000000$ indicating a path of length d between intersection a and a different intersection b. Jimmy may walk a path any direction he chooses. There is at most one path between any pair of intersections.

Output

For each test case, output a single integer indicating the number of different routes through the forest. You may assume that this number does not exceed 2147483647.

Sample Input

```
5 6
1 3 2
1 4 2
3 4 3
1 5 12
4 2 34
5 2 24
7 8
1 3 1
1 4 1
3 7 1
7 4 1
7 5 1
6 7 1
5 2 1
```

```
6 2 1
0
```

Output for Sample Input

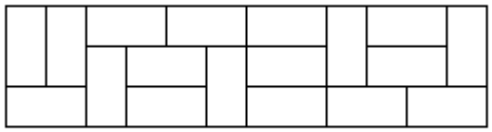
```
2
4
```

(apologies to) *Richard Krueger*

Problem D: Tri Tiling

In how many ways can you tile a 3x*n* rectangle with 2x1 dominoes?

Here is a sample tiling of a 3x12 rectangle.



Input consists of several test cases followed by a line containing *-1*. Each test case is a line containing an integer $0 \leqslant n \leqslant 30$. For each test case, output one integer number giving the number of possible tilings.

Sample input

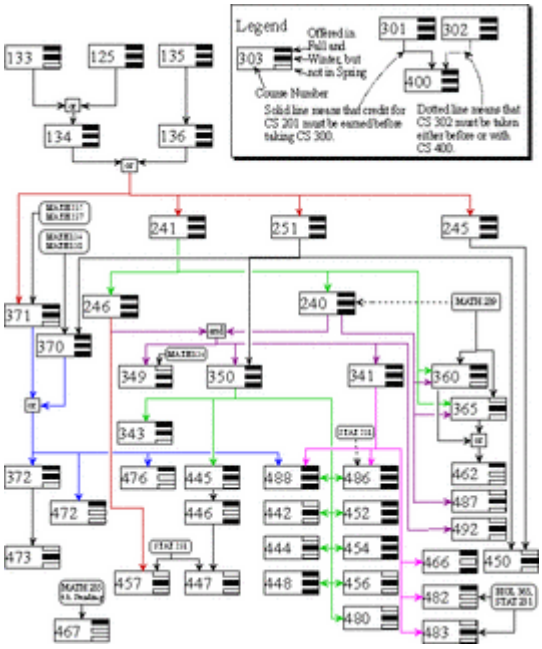
```
2
8
12
-1
```

Output for Sample Input

```
3
153
2131
```

Piotr Rudnicki

Problem E: Prerequisites?



Freddie the frosh has chosen to take *k* courses. To meet the degree requirements, he must take courses from each of several categories. Can you assure Freddie that he will graduate, based on his course selection?

Input consists of several test cases. For each case, the first line of input contains $1 \leq k \leq 100$, the number of courses Freddie has chosen, and $0 \leq m \leq 100$, the number of categories. One or more lines follow containing *k* 4-digit integers follow; each is the number of a course selected by Freddie. Each category is represented by a line containing $1 \leq c \leq 100$, the number of courses in the category, $0 \leq r \leq c$, the minimum number of courses from the category that must be taken, and the *c* course numbers in the category. Each course number is a 4-digit integer. The same course may fulfil several category requirements. Freddie's selections, and the course numbers in any particular category, are distinct. A line containing 0 follows the last test case.

For each test case, output a line containing "yes" if Freddie's course selection meets the degree requirements; otherwise output "no."

Sample Input

```
3 2
0123 9876 2222
2 1 8888 2222
3 2 9876 2222 7654
3 2
0123 9876 2222
2 2 8888 2222
3 2 7654 9876 2222
0
```

Output for Sample Input

```
yes
no
```

Gordon V. Cormack