Defense of the Ancients

As you don't like butthurt, choose a subset of size K with the smallest total amount of butthurt produced. More formally, choose a subset $P \subseteq \{1, 2, \ldots, n\}$, $|P| = K$ which minimizes

$$F(P) = \sum_{p \in P} a_p \cdot \sum_{p \in P} b_p.$$

Input

The first line of input contains two integer numbers N and K ($1 \le K \le N \le 1000$). Each of the next N lines contains two integer numbers a_i and b_i ($1 \le a_i, b_i \le 10^5$).

Output

On the first line, output the minimum value $F(P)$. The next line must contain exactly K integer numbers in ascending order: the numbers of the chosen guards. If there are several possible answers, output any one of them.

设 $\sum a_p = A, \sum b_p = B$，那么只有 (A, B) 构成的下凸包上的点是有用的。而凸包点数是 $M^{2/3}$ 的，可以整个求出来。具体来说，我们求 $ak + b$ 最小的 k 个点就可以找到凸包与斜率 k 的直线的切点。我们求出凸包最靠左和最靠右的两个点，然后以它们之间的斜率为 k，找到它们中点的一个点，然后向两侧递归下去。

Angel and Demon

Once again, we are in the dance class of professor Padegras to solve the problems of the great maestro. This time, at first glance, he faces a classic matching problem: there are N boys and N girls in his class, and for each possible pair of a boy and a girl, Padegras knows if they have a mutual sympathy to each other (and so, they can dance together). Looks like the only thing he needs is to know if there exists a perfect match.

The good news for the professor are that there is an Angel watching over him. The Angel enjoys making new sympathies in the professor's class.

The bad news for the professor are that there is also a Demon who dislikes the Angel. The Demon spoils existing sympathies.

More formally, there are K days left before the graduation ball in Mvodsk State University. On each day, the Angel makes exactly one new sympathy, and the Demon destroys exactly one existing sympathy. At every point of time, all sympathies are mutual. Note that the Angel can not make a sympathy that already exists at that moment.

The Angel and the Demon are actually playing a game. The Angel is said to be the winner if, after both players perform all their K moves, there is a perfect match in the sympathy graph. If there is no perfect match, the Demon wins.

The professor knows that one of the players always performs his move in the morning and another one in the evening, but he does not know who moves when. In both possible cases, determine the result of the game assuming that both players play optimally.

Input

The first line of input contains a single positive integer number T denoting the number of test cases. It is followed by T test case descriptions.

The first line of each description contains two integer numbers N and K ($0 \le K \le 10$).

The next N lines describe the relations in the class at the beginning of the game, each line contains exactly N characters which are 1 or 0. The j-th character of the i-th of these lines is 1 if the boy number i and the girl number j have a sympathy to each other, and is 0 otherwise. It is guaranteed that there will be at least one 1 and at least one 0, so both the Angel and the Demon are always able to make a move.

The sum of the values of N^2 for all test cases will not exceed 100 000.

Output

For each test case, print exactly one line containing two words separated by a space. First, print the result of the game where the Angel moves first. After that, print the result of the game where the Demon moves first. The result of the game is the name of the winner. Each name must be either "`Angel`" or "`Demon`", without quotes.

假如 Angel 先手：若初始无最大匹配则失败；否则，就是要加一条边使得 Demon 删哪条边都没用。枚举 Demon 删哪条边，那么可以求出一个 Angel 可以加边可以获得胜利的边集，我们只要把边集求个交就好了。

怎么求出这个边集？那么从 S 出发，可以到达的左部点构成一个集合；右部点可以到达 T 的也构成一个集合。那么只要连一条左集合到右集合的边就可以了。所以，左部点集合可以和右部点集合分别求交。

假如 Demon 先手，就是要删一条边使得最大匹配小于 $n-1$，退流即可。

Game With A Fairy

> *This is an interactive problem.*
>
> You met a fairy in a beautiful forest glade. The fairy is in good mood and would like to give you a present, but not before you best her in a game though.
>
> There are n trunks in the glade; the trunks are numbered from 1 to n. Some of the trunks (**possibly all, and at least one**) contain magical treasure. You can choose several trunks (possibly all) and list their numbers to the fairy. If none of them contain treasure, then you are unlucky and do not get any treasure. However, if more than one of the chosen trunks contains treasure, the fairy thinks you are too greedy and does not give you any treasure either. If **exactly one** of the trunks chosen by you contains treasure, then you get the treasure and are expelled from the forest (that is, the game ends).
>
> You can make at most **200** guesses before the night falls and the fairy becomes annoyed with you. It is guaranteed that the fairy is honest and does not move any treasure after you enter the forest. Can you best the fairy and get the precious treasure?

$(n \leq 10000)$。shuffle 一下，然后随机查长度为 $2, 4, 8, 16, \cdots$ 的前缀即可。

Two Airlines

> In Berland, there are two airlines: Aeroshipping and Wicktory (it was called Kindplane earlier). Since Berland is a developed country, for each pair of cities, there is an airline which provides flights between them. Since Berland is an economical country, for each pair of cities, there is only one such airline.
>
> The cities of Berland are numbered from 1 to n (so there are n cities in Berland). One tourist wants to travel around Berland, that is, he wants to visit each city exactly once and finish his trip in the city where he started. The starting city can be chosen arbitrarily.
>
> As the tourist doesn't want to annoy the airlines' staff, he wants to change airline no more than once. Unfortunately, the tourist does not know which airline controls each of the possible flights. To learn that, he can ask questions of the form "which airline controls the flight from city u to city v"? Obviously, the tourist doesn't want to waste too much time, so he decided to ask no more than $2n$ such questions.
>
> Help the tourist to make such a route! It is guaranteed that the answer exists.

我们维护一条链，左边都是 B，右边都是 W，设中间界点为 u。尝试加入一个点 v，查询 (u, v)，若为 W，则查询 $(u-1, v)$，然后发现一定能插的进去。

House Moving

> There are N houses numbered 1 through N. The distance between the house i and the house j is $|i-j|$.
>
> You want to assign M families to these houses. There are P_i people in the i-th family. No two families can be assigned to the same house.
>
> Your objective is to maximize the *distance of residents*. For each (unordered) pair of two people among the M families, compute the distance between their houses. The *distance of residents* is defined as the sum of these values for all pairs.
>
> Compute the maximum possible value of the *distance of residents*.

- $2 \le N \le 10^6$
- $2 \le M \le \min(N, 1000)$
- $1 \le P_i \le 100$

首先，只有一个前缀或者一个后缀的房子是有用的。并且填入的人数肯定是先减小再上升，交界点就是中间的分隔。我们 dp，设 $f_{i,j}$ 表示前 i 个人和为 j 的最大值，加入的时候考虑中间这条边的贡献（左边乘右边），恰好是可以算的；最后，中间这条长边的贡献也是很好算的。

Eel and Grid

> There is an $H \times W$ grid. Let $(i,\ j)$ be the cell at the intersection of the i-th row $(0 \le i \le H-1)$ and the j-th column $(0 \le j \le W-1)$. Initially, there is an eel at the cell $(0,\ 0)$. The eel repeats the following process.
>
> - If the current cell is painted, end the process.
> - If the current cell is not painted, paint the cell and move to another cell. If the current cell is $(i,\ j)$, the new cell must be either $((i+1) \bmod H,\ j)$ or $(i,\ (j+1) \bmod W)$.
>
> Count the number of ways to paint all cells and end the process at the cell $(0,\ 0)$, modulo 10^9+7. Two ways are considered distinct if the path traveled by the eel are distinct.

考虑每个格子的方向。首先可以发现 (i,j) 和 $(i+1,j+1)$ 的方向是一样的，所以构成了几条对角线，然后单独考虑某一条对角线，考虑不会提前成环的条件并用组合数算算就好了。

Travel in Sugar Country

> There are N towns numbered 1 through N. There is a bidirectional road between towns i and $i+1$, and its length is D_i. Thus, for each pairs $(a,\ b)$ $(a < b)$, the distance between towns a and b is $D(a,b) = D_a + D_{a+1} + \ldots + D_{b-1}$.
>
> At each town there is a sugar shop. An ant wants to visit K distinct shops.
>
> The ant wants to choose a set of K distinct shops and the order to visit them. For example, if it decides to visit the shops $S_1, \ldots, S_K$ in this order, the total distance it travels will be $D(S_1,S_2) + D(S_2,S_3) + \ldots + D(S_{K-1},S_K)$.
>
> In how many ways the total distance it travels become a multiple of M? Print the answer modulo 10^9+7.
>
> - $2 \le N \le 100$
> - $1 \le M \le 30$
> - $2 \le K \le 10, K \le N$
> - $1 \le D_i \le M$
> - All values in the input are integers.

直接按照 K 的顺序肯定不能考虑，我们得转置，按照 $1 \sim N$ 的顺序去考虑，记下 2^K 表示是否选了，然后贡献也是可以计算的。

事实上，只要记下来划分成几条链就够了！$2^K \to K$。

Eels

> 小V有一个水缸和一堆鱼，水缸初始是空的，小 V 接下来会向水缸内加入一些鱼，同时也可能将已加入的鱼捞出来。水缸里的鱼会相互攻击，直到只有一条鱼为止。也就是说如果有 n 条鱼，则会发生 $n-1$ 次攻击。如果一条鱼的重量为 A，另一条鱼重量为 B，如果 $A \le B$，则 B 鱼会吃掉 A 鱼，然后 B 鱼体重变为 $A+B$。
>
> 对于一场攻击来说，如果一条鱼的重量为 A, 另一条鱼重量为 B，如果 AB 满足条件：$A \le B$ 而且 $B \le 2A$ 那么我们定义这场攻击是危险的。
>
> 现在小 V 会有 q 次操作，包括加入一条体重为 x 的鱼，或捞出一条水缸内的、体重为 x 的鱼。
>
> 小 V 想知道，在每次操作后，水缸内能发生的最多的危险攻击次数是多少。

首先，按照哈夫曼树的方式去合并，可以最大化危险攻击次数；一次攻击 $A+B, A<B$ 是危险的，当且仅当 B 前面的所有数的和小于 B。

观察到：$[2^k, 2^{k+1})$ 中至多有一个数的合并是危险的，并且这个数一定得是这个区间中唯一的数。二进制分组并维护即可。

事实上，这也构成了对哈夫曼树复杂度的证明。

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