Problem A. The Fool

Time limit 1000 ms
Mem limit 262144 kB
OS Windows

The Fool is numbered 0 �C the number of unlimited potential �Cand therefore does not have a specific place in the sequence of the Tarot cards. The Fool can be placed either at the beginning of the Major Arcana or at the end. The Major Arcana is often considered as the Fool's journey through life and as such, he is
ever present and therefore needs no number.

Given n $\in N_+$, print the parity of

$$\sum_{i=1}^{N} [\frac{n}{i}] \ ,$$

where [x] = max a (a∈**Z**,a≤x)

Input
The first line of the input contains one integer $T \le 100$, denoting the number of testcases. Then T testcases follow.
In each of the T testcases, there is a positive number $n \le 10^9$.

Output
For each testcase, print a single line starting with "**Case** i : "(i indicates the case number) and then "even" or "odd", separated with a single space.

Sample

Input	Output
3 1 10000 100000000	Case 1: odd Case 2: even Case 3: even

Problem B. The World

Time limit 1000 ms
Mem limit 262144 kB
OS Windows

The World can indicate world travel, particularly on a large scale. You may be lucky enough to be embarking on a six-month overseas trip, or are working, studying or living overseas for an extended period of time. Similarly, this card reinforces Universal understanding and global awareness, and you will have a new appreciation for people and cultures from across the world.

Across the world there are various time zones, leading to time differences. Here you are informed of several famous capitals and their corresponding time zones.

- Beijing - China - UTC + 8 (China Standard Time)
- Washington - United States - UTC - 5 (Eastern Standard Time)
- London - United Kingdom - UTC (Greenwich Mean Time)
- Moscow - Russia - UTC + 3 (Moscow Time)

Given the local time of a city, you are expected to calculate the date and local time of another specific city among the above capitals.

Input

The first line of input contains a single integer $T \le 1000$ indicating the number of testcases. Each testcase consists of three lines. The first line is in the form of "hour:minute AM/PM" ($1 \le hour \le 12$, $00 \le minute \le 59$) indicating the local time. Next two lines contain two strings s_1, s_2. s_1 is the name of city corresponding to the given time, while s_2 indicates the city you are expected to calculate the local time.

Output

For each testcase, begin with "Case i:", where i indicate the case number, and then output a single line in the following format"Yesterday/Today/Tomorrow $hour : minute$ AM/PM", separated by spaces. The first word describes the corresponding date.

Sample

Input	Output
2 12:00 AM London Moscow 4:00 PM London Beijing	Case 1: Today 3:00 AM Case 2: Tomorrow 12:00 AM

Problem C. Justice

Time limit	4000 ms
Mem limit	262144 kB
Special judge	Yes
OS	Windows

Put simply, the Justice card represents justice, fairness, truth and the law. You are being called to account for your actions and will be judged accordingly. If you have acted in a way that is in alignment with your Higher Self and for the greater good of others, you have nothing to worry about. However, if you have
acted in a way that is out of alignment, you will be called out and required to own up to your actions. If this has you shaking in your boots, know that the Justice card isn't as black and white as you may think.

On the table there are n weights. On the body of the i-th weight carved a positive integer k_i , indicating that its weight is $\frac{1}{2^{k_i}}$ gram. Is it possible to divide the n weights into two groups and make sure that the sum of the weights in each group is greater or equal to $\frac{1}{2}$ gram? That's on your call. And please tell us how if possible.

Input
In the first line of the input there is a positive integer T ($1 \le T \le 2000$), indicating there are T testcases.
In the first line of each of the T testcases, there is a positive integer n ($1 \le n \le 10^5$, $\sum n \le 7 \times 10^5$), indicating there are n weights on the table.
In the next line, there are n integers k_i ($1 \le ki \le 10^9$), indicating the number carved on each weight.

Output
For each testcase, first print Case i: ANSWER **in one line**, i indicating the case number starting from 1 and ANSWER should be either YES or NO, indicating whether or not it is possible to divide the weights. Pay attention to the space between : and ANSWER.
If it's possible, you should continue to output the dividing solution by print a 0/1 string of length n **in the next line**. The i-th character in the string indicating whether you choose to put the i-th weight in group 0 or group 1.

Sample

Input	Output
3 3 2 2 2 3 2 2 1 2 1 1	Case 1: NO Case 2: YES 001 Case 3: YES 10

Problem D. The Moon

Time limit	1000 ms
Mem limit	262144 kB
Special judge	Yes
OS	Windows

The Moon card shows a large, full moon in the night's sky, positioned between two large towers. The Moon is a symbol of intuition, dreams, and the unconscious. The light of the moon is dim, compared to the sun, and only vaguely illuminates the path to higher consciousness which winds between the two towers.

Random Six is a FPS game made by VBI(Various Bug Institution). There is a gift named "Beta Pack". Mr. K wants to get a beta pack. Here is the rule.
Step 0. Let initial chance rate $q = 2\%$.
Step 1. Player plays a round of the game with winning rate p.
Step 2. If the player wins, then will go to Step 3 else go to Step 4.
Step 3. Player gets a beta pack with probability q. If he doesn't get it, let $q = \min(100\%, q + 2\%)$ and he will go to Step 1.
Step 4. Let $q = \min(100\%, q + 1.5\%)$ and goto Step 1.
Mr. K has winning rate $p\%$, he wants to know what's the expected number of rounds before he needs to play.

Input
The first line contains testcase number T ($T \le 100$). For each testcase the first line contains an integer p ($1 \le p \le 100$).

Output
For each testcase print **Case** i : and then print the answer in one line, with absolute or relative error not exceeding 10^6.

Sample

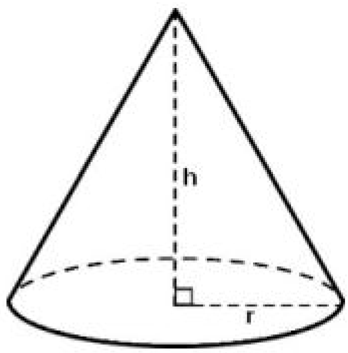
Input	Output
2 50 100	Case 1: 12.9933758002 Case 2: 8.5431270393

Problem E. The Tower

Time limit	1000 ms
Mem limit	262144 kB
Special judge	Yes
OS	Windows

The Tower shows a tall tower perched on the top of a rocky mountain. Lightning strikes, setting the building alight, and two people leap from the windows, head first and arms outstretched. It is a scene of chaos and destruction.

There is a cone tower with base center at (0, 0, 0), base radius r and apex (0, 0, h). At time 0 , a point located at (x_0, y_0, z_0) with velocity (v_x, v_y, v_z). What time will they collide? Here is the cone tower.



Input

The first line contains testcase number T ($T \le 1000$), For each testcase the first line contains spaceseparated real numbers r and h ($1 \le r, h \le 1000$) — the base radius and the cone height correspondingly.

For each testcase the second line contains three real numbers x_0, y_0, z_0 ($0 \le |x_0|, |y_0|, z_0 \le 1000$). For each testcase the third line contains three real numbers v_x, v_y, v_z ($1 \le v_x^2 + v_y^2 + v_z^2 \le 3 \times 10^6$). It is guaranteed that at time 0 the point is outside the cone and they will always collide.

Output

For each testcase print Case i : and then print the answer in one line, with absolute or relative error not exceeding 10^{-6}

Sample

Input	Output
2 1 2 1 1 1 -1.5 -1.5 -0.5 1 1 1 1 1 -1 -1 -1	Case 1: 0.3855293381 Case 2: 0.5857864376

Problem F. The Hermit

Time limit	15000 ms
Mem limit	262144 kB
OS	Windows

The Hermit stands alone on the top of a mountain with a lantern in his hand. The snow-capped mountain range symbolises the Hermit's spiritual achievement, growth and accomplishment. He has chosen this path of self-discovery and, as a result, has reached a heighted state of awareness

dhh loves to listen to radio. There are N radio stations on a number axis, and the i-th station is located at $x_i = i$. The broadcasting scope of the i-th station is rad_i , which means stations in the interval $[i - rad_i + 1, i + rad_i - 1]$ can receive the signal from the i-th station. For some unknown reason, the left boundary that can receive the i-th station's signal is non-descending, which meansi $i - rad_i + 1 \le i + 1 - rad_{i+1} + 1$.
Now dhh wants to listen to the radio from station i, and he finds that the station k, satisfying both of the following conditions, can receive perfect signal from the station i:

- k < i and station k can receive station i's signal.

- There exists another station $j(k \le j < i)$ such that station k and i can both receive the signal from station j and the distance between station k and j is greater than or equal to the distance between station j and i.

Now dhh wonders for each station i, how many stations can receive the perfect signal from station i.

Input
The first line of the input contains one integer $T \le 20$, denoting the number of testcases. Then T testcases follow. For each testcase:

- The first line contains one positve integer N.

- The second line contains N positive integers $rad_1, rad_2, \dots, rad_N$.

It's guaranteed that $1 \le N \le 10^6$,$i - rad_i + 1 \ge 1$ and $i + rad_i - 1 \le N$

Output
For the k-th testcase, output "Case k: ans" in one line, where ans represents the xor result of answer for each radio station i.
xor is a bitwise operation, which takes two bit patterns of equal length and performs the logical

exclusive OR operation on each pair of corresponding bits. The result in each position is 1 if only the first bit is 1 or only the second bit is 1, but will be 0 if both are 0 or both are 1. In this we perform the comparison
of two bits, being 1 if the two bits are different, and 0 if they are the same.

Sample

Input	Output
2 7 1 2 3 4 3 2 1 10 1 1 2 3 4 4 3 2 2 1	Case 1: 2 Case 2: 0

Hint

In the first testcase of the example, the number of stations that can receive the perfect signal from each station i is respectively 0, 0, 1, 2, 1, 0, 0 in order, so the answer must be

$$0 \text{ xor } 0 \text{ xor } 1 \text{ xor } 2 \text{ xor } 1 \text{ xor } 0 \text{ xor } 0 = 2$$

Problem G. High Priestess

Time limit	5000 ms
Mem limit	262144 kB
Special judge	Yes
OS	Windows

Look for areas in your life that may be out of balance or lacking 'flow' and ease. Knowledge of how to fix these issues will not come through thinking and rationalising, but through feeling and trusting your intuition, so allow yourself the time and space to meditate and listen to your inner voice. Your intuitive sense right now is providing you with useful and helpful information and is assisting you to become more in touch with your subconscious mind.

Your task is **simple**: to build a circuit with effective resistance as close to a target value as possible.

Specifically, you are given a 1V battery, 10^4 resistors of 1Ω and unlimited number of conductive posts. You can attach each resistor to an arbitrary pair of different posts. Different resistors may be attached to same pairs of posts and you do not need to use up all the resistors (definitely not all posts either). When you finish all attachments, you can finally choose two posts to attach the battery on.

For convenience, we can observe the resistor network you build as a undirected graph G = (V, E). Naturally in this mapping each post with at least one resistor attached to it is a vertex in V and each resistor is an undirected edge in E. Following basic physics laws we can calculate the voltage at each post x, denoted as v_x (suppose the voltage at the negative post of the battery is 0) and the sum of current flowing through all resistors between posts x and y, denoted as ixy. We can now define the effective resistance between any pair of posts a and b as

$$\tilde{r}_{ab} = \frac{v_a - v_b}{\sum_{(a,c)\in E} i_{ac}} = \frac{v_b - v_a}{\sum_{(b,d)\in E} i_{bd}} = \tilde{r}_{ba}$$

Suppose the battery is attached to post a_0 and b_0, your task is to build a graph such that $|r_{a_0b_0}$ - r| ÷ 10^{-7} for any given r.

There are one more constraint - you are only allowed to build the graph following the procedures below.

First you have n resistors of 13, numbered from 0 to n n 1. And each of the resistors can be seen as a graph of 2 posts and 1 edge. You are then allowed to perform several merge operations to any two of the graphs you currently have to form a new graph. The original two graphs are then removed and the new graph is added to your graph pool and numbered consecutively starting from n (that is to say, the graph obtained in the first operation has the number n and in the

second operation the number is n + 1 and so on).
There are two types of merge operations, a serial merge or a parallel merge. Specifically, if the two graphs you choose to merge is o -> A -> o and o -> B -> o (the o refers to the posts and the -> refers to how the current flows) respectively. After a serial merge, the new graph will be

$$\circ \to A \to \circ \to B \to \circ$$

and after a parallel merge, the new graph will be

Input

First line of the input contains a single positive integer T (T ≤ 20) denoting the testcase count.
In each test case, a single line of a real number r (0.1 ≤ r ≤ 0.9) will be presented. This is your target resistance.

Output

For each testcase, first you have to print Case i: in one line, in which i is the case number starting from 1. In the next line you should print two integers n and m (1 ≤ m < n ≤ 10^4) **in one line**, denoting the number of resistors you initially need and the total number of operations you wish to perform.
In the following m lines, you have to print an operation in one line in the format of
op x y
where op should be 0 if you wish to perform a serial merge and 1 if you wish to perform a parallel merge. x and y are the numbers of the two graphs you wish to merge. Note that all graphs are numbered following the rule described in the statement automatically.
We assume the last graph obtained from your last operation is your final answer.
Do not print extra empty lines in your output.

Note

The solution is not unique. Your answer will be special judged and will be accepted if $|r - your\_answer| \le 10^{-7}$.
The basic physics laws:

- Ohm’s law: the current through a conductor between two points is directly proportional to the voltage across the two points.

$$I = \frac{V}{R}$$

- Kirchhoff ’s law: the

$$\sum_{k=1}^{n} I_k = 0$$

Sample

Input	Output
2 0.5 0.6666666666666667	Case 1: 2 1 1 0 1 Case 2: 6 5 1 0 1 1 2 6 1 3 4 1 5 8 0 7 9

Problem H. Lovers

Time limit 15000 ms
Mem limit 262144 kB
OS Windows

The Fool comes to a cross-road, filled with energy, confidence and purpose, knowing exactly where he wants to go and what he wants to do. But he comes to a dead stop. A flowering tree marks the path he wants to take, the one he's been planning on taking. But standing before a fruit tree marking the other path is a woman. The Fool has met and had relationships with women before, some far more beautiful and alluring. But she is different. Seeing her, he feels as though he's just been shot in the heart with cupid's arrow.

There are n empty strings:

$$s_1, s_2, \ldots, s_n.$$

You are required to perform two kinds of operations:

- wrap $l\ r\ d$: change s_i to ds_id for all l ≤ i ≤ r, where d is a digit character.
- query $l\ r$: query $\sum_{i=l}^{r}$ value(s_i) (mod 10^9 + 7), where $value(s)$ is the number that string s

represents.

Note that the value of an empty string is 0.

Input

The first line contains one integer T, which denote the number of cases.
For each case, the first line contains two integer n and m where n is the number of strings and m is the number of operations.
Each line of the following m lines contains an operation with format

$$wrap\ l\ r\ d$$

or

$$query\ l\ r$$

.

Output

For each case, you should output "Case i:"in a line, where i is the case number starting from 1. Then for each query operation in that case, output a line that contains a single integer that representing the answer for that query operation.

Sample

Input	Output
2 3 2 wrap 1 3 1 query 1 2 4 4 wrap 1 3 0 wrap 2 4 3 query 1 4 query 2 3	Case 1: 22 Case 2: 6039 6006

Hint

1 ≤ T ≤ 5, 1 ≤ n, m ≤ 1e5, 1 ≤ l ≤ r ≤ n.

Problem I. Strength

Time limit 1000 ms
Mem limit 262144 kB
OS Windows

Strength gives you the confidence within yourself to overcome any fears, challenges or doubts. Feel the fear and do it anyway! If you have been going through a rough time and feel burnt out or stressed, the Strength card encourages you to find the strength within yourself and keep going. You have got what it takes to see this situation through to its eventual end. You might also feel compelled to hold space for someone else who is going through a difficult period and needs your strength and support.

Alice and Bob are playing "Yu-Gi-Oh!", a famous turn-based trading card game, in which two players perform their turns alternatively. After several turns, Alice and Bob have many monsters respectively.
Alice has n and Bob has m monsters under their own control. Each monster's strength is measured by a non-negative integer s_i . To be specific, the larger s_i is, the more power the monster has.
During each turn, for every single monster under control, the player can give a command to it at most once, driving it to battle with an enemy monster (given that opposite player has no monsters as a shield, the monster can directly attack him).
Additionally, the process of the battle is also quite simple. When two monsters battle with each other, the stronger one (i.e. the one with larger s_i) will overwhelm the other and destroy it and the winner's strength will remain unchanged. Meanwhile, the difference of their strength will produce equivalent damage to the player who loses the battle. If the player is directly attacked by a monster, he will suffer from the damage equal to the monster's strength. Notice that when two monsters have the same strength, both of them will vanish and no damage will be dealt.
Right now it is Alice's turn to play, having known the strength of all monsters, she wants to calculate the maximal damage she can deal towards Bob in one turn. Unfortunately, Bob has great foresight and is well-prepared for the upcoming attack. Bob has converted several of his monsters into defense position,
in which even if the monster is destroyed, he wouldn't get any damage.
Now you are informed of the strength of all the monsters and whether it is in defense position for each Bob's monster, you are expected to figure out the maximal damage that could be dealt in this turn.

Input
The first line contains a single integer $T \le 20$ indicating the number of test cases.
For each test case, the first line includes two integer $0 \le n, m \le 100000$, representing the

number of monsters owned by Alice and Bob.
In next three lines, the first two lines include n and m integers $0 \le s_i \le 10^9$ indicating the strength of the i-th monster, separated by spaces. The last line contains m integers 0 or 1 indicating the position of Bob's i-th monsters.In other words, 0 represents the normal position and 1 represents the defense position.

Output

For the ith test, output a single line in beginning of "Case i:", followed by an integer indicating the answer, separated by a single space.

Sample

Input	Output
2 4 2 10 10 10 20 5 15 0 1 4 2 10 10 10 20 5 25 0 1	Case 1: 25 Case 2: 15

Problem J. Wheel of Fortune

Time limit 8000 ms
Mem limit 262144 kB
OS Windows

The Wheel of Fortune reminds you that the wheel is always turning and life is in a state of constant change. If you're going through a difficult time right now, rest assured it can only get better from here and soon you will be blessed with good luck and good fortune. Similarly, if things are going amazingly well, know that this too will change and life may return to 'normal' soon after. This is why it is so important to cherish the blissful moments in your life and make the most of them while they are within reach �C because in a flash they could be gone.

Alice wants to make a wheel and decorate it with a circle of jewels. She has n different jewels each of which can be colored in m colors. The arrangement of Jewels always symbolizes fortune. Specifically, when the i-th jewel is colored with the c_i-th color, it is attached with a_i,c_i amount of luck. After coloring all the n jewels, she needs to arrange them in some order k_1, k_2, · · · , k_n(a permutation) such that no two adjacent jewels on the wheel are of the same color. Otherwise she may encounter disasters. Alice enjoys peaceful life and wants to find the minimum possible |max{a_{k_i},c_{k_i}|1 ≤ i ≤ n} - min{a_{k_i},c_{k_i}|1 ≤ i ≤ n}from all the valid arrangements.

Input
The input starts with a line containing a number T which indicates the number of test cases. Each test case starts with a line containing two numbers n (2 ≤ n ≤ 2000) and m (1 ≤ m ≤ 2000) which indicate the number of jewels and colors respectively. Then n lines follow and each contains m numbers indicating $a_{i,j}$ (1 ≤ $a_{i,j}$ ≤ 1000000)

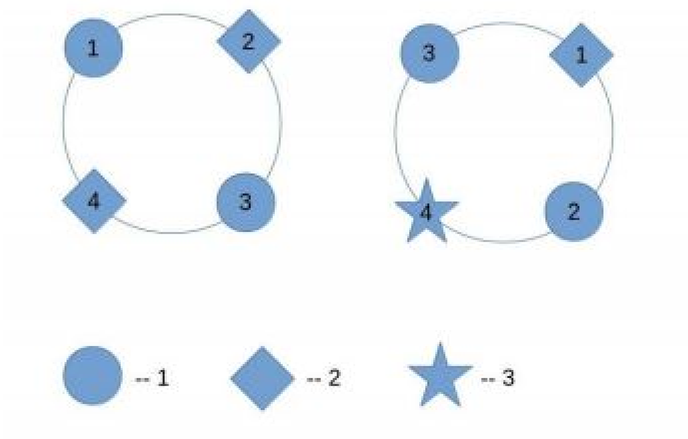
Output
For each test case, please print only one line in the form of "Case x: ans", where x is the test number and ans indicates the answer. If it is impossible for Alice to find a valid arrangement, the answer is -1.

Sample

Input	Output
2 4 2 1 2 2 1 1 1 2 2 4 3 8 3 7 2 6 7 2 7 3 5 6 3	Case 1: 1 Case 2: 1

Hint

The following picture is the illustration of the samples, in which numbers and shapes indicate indexes of jewels and their colors separately.
In the first sample, we use the first color to color the jewels with indexes 1 and 3, and color the others with the second color.
In the second sample, we use the second color to color the jewel with index 1, the first color to color the jewels with indexes 2 and 3, and the third one to color the jewel with index 4.
The orders of jewels are illustrated below.



Problem K. The Magician

Time limit	1000 ms
Mem limit	262144 kB
OS	Windows

In your quest to manifest your goals, it is essential that you establish a clear vision of what you wish to create and why you want to create it, before you take action. It is not simply enough to be motivated by ego (money, status, or fame) �C you need to have a soul connection to your goals and intentions.

Background

Magician Alice and Bob are playing Magic Duel, which is an amusing turn-based game. Here goes the tutorial to the game. Their strategy and the process of the game are determined and all you need to do is to figure out the result.

Game Structure

The game consists of four separate areas containing several cards:Deck,Hand, Field, Grave.

Deck

The library of your cards �C each turn you can draw a card from the top of the deck to your hand.

Hand

The collection of your available cards �C each turn you can place a card from your hand to your field.

Field

The set of your active cards - the key to victory.

Grave

The place of all the discarded or destroyed cards.

Notice that the **Field** and the **Grave** are public (i.e. known to each other), whereas the **Deck** and **Hand** are private. All these four areas are independent for each player.

Process of the Game

Initially, each player draws five cards from the top of the deck, and two players play their own turns alternatively (Alice goes first). Each turn includes the following three phases in order.

Draw Phase

Draw a card from deck into hand. If the deck is empty this phase is skipped.

Main Phase

Select a card from hand, placing it into field and dealing corresponding effect. Player can choose to skip this phase.

End Phase

If the victory condition is reached by the player, he is announced to win immediately. Otherwise, switch the turn to the opponent.

Card Introduction

Two players' decks consist of same cards but in different order. In each deck lie 25 cards in 5 categories evenly. In other words, each kind of cards contains 5 identical cards. Here goes the introduction to the effects produced by these cards when played.

Plain

Draw a card from the deck (if the deck is empty it has no effect).

Swamp

Enemy player selects a card from his hand and discard it into his grave (if enemy's hand is empty it has no effect).

Mountain

Select a card inside enemy's field and destroy it, sending it into enemy's grave (if enemy's field is empty it has no effect).

Island

No effect. However, in enemy's turn, when enemy intends to play a card (notice that you don't know the card's type because it hasn't entered the field), you can discard an island from your hand firstly and discard another card from hand as cost to counter-attack the card, sending it to enemy's grave and preventing it from dealing any effects.

Forest

Select a card in his own grave and recycle it into his hand (if the grave is empty it has no effect).

Victory Condition

If the player has gathered five different kinds of cards in his field, he wins. If the game lasts 100 turns or both players have no cards in their decks or hands, it is a tie.

Strategy

Play Strategy

When selecting a card to play in Main Phase, the player labels his card in hand with three priority levels.

High Priority

There is no card of the same type in his own field and it has effect if played.

Medium Priority

There is no card of the same type in his own field but it has no effect if played.

Low Priority

There are cards of the same type in his own field.

For the cards with the same priority, the player selects them in the following order: Swamp, Plain, Mountain, Forest and Island. Notice that if the player only has low-priority cards in hand he will skip the Main Phase.

Discard Strategy

When player needs to discard a card from hand, this strategy works. The player will select the card with most occurrences in hand among all cards and discard it. For the cards with the same occurrences, player will select them in the following order: Island, Mountain, Plain, Swamp, Forest.

Destroy Strategy

When Mountain is played by player himself, he will select the card with the least occurrences in enemy's field among all cards in enemy's field and destroy it. For the cards with the same occurrences, player will select them in the following order: Forest, Island, Mountain, Plain, Swamp.

Counter-attack Strategy

When enemy intends to play a card, if enemy has gathered four kinds of card in his field and the number of the fifth kind of card in enemy's grave is less than 5, player will choose to counter-attack. Obviously, player is required to have an Island and another card in his hand to have this done. The choice of cost card also follows the Discard Strategy.

Recycle Strategy

When player plays Forest, he selects the card with the least occurrences in his own field and hand among all cards in his grave and recycles it into his hand. For the cards with the same occurrences, the player will select them in the following order: Forest, Swamp, Mountain, Island, Plain.

Input

The first line contains a single integer $T \le 20000$ indicating the number of tests.
For each test case, input contains two lines with 25 integers between 0 and 4 (inclusive) separated by spaces, representing the cards in Alice and Bob's decks from top to bottom. 0, 1, 2, 3, 4 respectively stand for Plain, Swamp, Mountain, Island, Forest.

Output

For each test, start with "Case i:", where i indicates the number of the case, and then output a single line containing a string and an integer indicating the winner of the game ("Alice", "Bob" or "Draw" if the game ties) and how many turns the game lasts, separated by spaces.

Sample

Input	Output
3 0 0 0 0 0 1 1 1 1 1 2 2 2 2 2 3 3 3 3 3 4 4 4 4 4 0 0 0 0 0 1 1 1 1 1 2 2 2 2 2 3 3 3 3 3 4 4 4 4 4 4 3 2 1 1 3 1 2 1 3 2 3 0 0 4 0 3 4 0 4 2 2 1 0 4 0 0 3 2 4 3 4 0 2 4 1 2 4 3 1 1 3 2 2 3 1 0 1 4 0 4 0 0 3 1 2 4 4 1 3 1 3 0 4 0 2 2 1 2 2 3 3 4 1 0 4 0 4 1 4 1 4 1 4 0 0 2 3 1 3 2 3 2 1 0 2 3 0 2 3	Case 1: Bob 36 Case 2: Alice 17 Case 3: Alice 9

Problem L. The Hanged Man

Time limit	1000 ms
Mem limit	262144 kB
OS	Windows

The Hanged Man shows a man suspended from a t-shaped cross made out of living wood. The man is hanging upside-down, viewing the world from a completely different perspective. His facial expression is calm and serene, suggesting that he is in this hanging position by his own choice.

Bobo has two arrays $a_1, a_2, \ldots, a_n$ and $b_1, b_2, \ldots, b_n$. For each set $S \subseteq \{1, 2, \ldots, n\}$, he denotes $A(S) = \sum_{i \subseteq S} a_i$ and $B(S) = \sum_{i \subseteq S} b_i$.
Bobo also has a tree of n vertices conveniently labeled with $1, 2, \ldots, n$. A set $S \subseteq \{1, 2, \ldots, n\}$ is an **independent set** if and only if for any two vertices u and v connected directly on the tree, either $u \notin S$ or $v \notin S$ holds.
For each $x \subseteq \{1, 2, \ldots, m\}$, Bobo would like to find f(x) which is the number of **independndt set** S with $A(S) = x$ and $B(S)$ maximized.
Formally, f(x) = $|\{S : S \subseteq I, A(S) = x, B(S) = max_{T \subseteq I}^{A(T)=x} B(T)\}|$ where I stands for the family of the independent sets. Suppose there is no $A(S) = x$ for some i, then $f(x) = 0$.
Find out the value of f(1), f(2), . . . , f(m).

Input
The first line of the input contains one integer $T \leq 20$, denoting the number of testcases. Then T testcases follows, separated with no extra blank lines.
The first line of each test case contains two integers n and m.
The i-th of the following n lines contains two integers a_i and b_i.
The i-th of the last (n - 1) lines contains two integers u_i and v_i which denotes an edge connected vertices u_i and v_i.

- $1 \leq n \leq 50$
- $1 \leq m \leq 5000$
- $1 \leq a_i \leq m$
- $1 \leq b_i \leq 10^6$
- $1 \leq u_i, v_i \leq n$

Output

For each testcase, first print "Case i:" in one line (i indicates the case number, starting from 1). In the line, print m integers which denote f(1), f(2), . . . , f(m).

Sample

Input	Output
3 3 2 1 1 1 1 1 1 1 2 1 3 4 5 1 1 2 2 3 2 2 1 1 2 2 3 3 4 5 10 3 1 2 2 4 4 7 8 5 16 1 2 1 3 2 4 2 5	Case 1: 3 1 Case 2: 1 1 2 2 0 Case 3: 0 1 1 1 1 1 1 1 1