2021东华大学金马程序设计联赛题目集

A. Smart AEMShana!

AEMShana isn't just charming, he is also very smart.

While some of us were learning the addition table, AEMShana had fun in his own manner.
AEMShana painted an $m \times m$ addition table, where the element on the intersection of the i-th row and j-th column equals $i + j$ (the rows and columns of the table are numbered starting from 1).

Then he was asked: what number in the table is the k-th least number? AEMShana always answered correctly and immediately. Can you repeat his success?

Consider the given addition table. If you write out all $m \times m$ numbers from the table in the decreasing order, then the k-th number you write out is called the k-th leaest number.

Note

A 3×3 addition table looks like this:

2 3 4
3 4 5
4 5 6

Input

There are multiple test cases(not more than 1000) in this problem.

In each test case contains integers m and k.

$(1 \le m \le 10^9, 1 \le k \le m \times m)$

Output

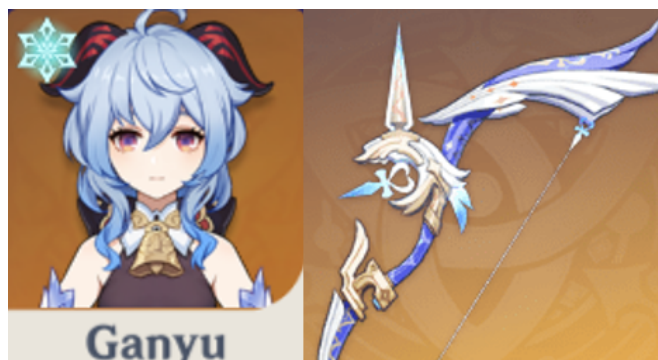Print the k-th least number in a $m \times m$ addition table.

Sample Input

```
3 4
114514 1919810
```

Sample Output

```
4
1960
```

B. Genshin Impact

Ganyu

IDEA is currently playing the game Genshin Impact. She likes the character Ganyu very much, so she wants to increase Ganyu's ATK as much as possible. Please help her. If you've ever played the Genshin Impact, please also read the problem carefully, because in this problem, there is something different with the game Genshin Impact.

IDEA use Ganyu of level 90, and has the following attributes:

Level	Base Max HP	Base ATK	Base DEF	Base CRIT DMG	Base CRIT Rate
90	9797	335	630	38.4%	5%

The weapon used by Ganyu is Amos' Bow. The Amos' Bow has the following attributes:

Base ATK	Percentage ATK	Passive Skill
608	49.6%	Increases Normal Attack and Charged Attack DMG by 12%.

In this problem, we only consider Ganyu's charged attack. Ganyu's charged attack deals two sections of damage:

- In first section Ganyu fire off an Frostflake Arrow that deals Cryo damages.
- In second section the Frostflake Arrow blooms after hitting opponents, dealing AoE Cryo damage.

The total damage of Ganyu's charged attack are the sum of the damage of the Frostflake Arrow and the Frostflake Arrow Bloom. The percentage ATK bonus of the Frostflake Arrow is 230%, and the percentage ATK bonus of the Frostflake Arrow Bloom is 392%.

Let we assumed that Ganyu's attack will always hit the target, and the two sections of damage are independent. Each section of damage will cause critical strike or not depends on the CRIT Rate. Since Ganyu is very powerful on her own, we are not considering the bonus damage from elemental reactions in this problem.

The damage calculate formula is following:

If there is no critical strike:

Damage=total ATK × percentage ATK bonus of character skills × (1+elemental DMG bonus + increased DMG)×(1- the resistance of monster) × ratio of damage taken by monsters

If there is critical strike:

Damage=total ATK × percentage ATK bonus of character skills × (1+elemental DMG bonus + increased DMG)×(1- the resistance of monster) ×ratio of damage taken by monsters × (1+CRIT DMG)

Now let we explain these parameters.

Total ATK

Total ATK = (character's base ATK + weapon's base ATK) × (1 + percentage ATK bonus) + numerical ATK bonus.
Note that the percentage ATK bonus is only provided by artifacts and weapons. Attention it that the percentage ATK bonus of character skills is not included in this part. The numerical ATK bonus only provided by artifacts.

Percentage ATK bonus of character skills

As mentioned above, the percentage ATK bonus of Frostflake Arrow is 230%, and the percentage ATK bonus of Frostflake Arrow Bloom is 392%.

Elemental DMG bonus

Elemental DMG bonus is only provided by artifacts, and only applies to attacks of the corresponding element.

Increased DMG

Increased DMG is provided by the Passive Skill of weapon or the effect of artifacts (such as "Wanderer's Troupe" 4-piece set bonus)。

CRIT DMG

CRIT DMG is the sum of character's base CRIT DMG and the CRIT DMG provided by weapon.

CRIT Rate

CRIT Rate is the sum of character's base CRIT Rate and the CRIT Rate provided by weapon. If the CRIT Rate is exceeding 100%, we still assume it as 100%

Ratio of damage taken by monster

Ratio of damage taken by monsters = (the level of character + 100)/(the level of monster + the level of character + 200)

The resistance of monsters

Monsters have different resistance of different element. The Cryo element resistance of monsters in this problem is showed below.

The monster's name	Hilichurl	Pyro_Whopperflower	Cryo_Whopperflower	Cryo_Slime
Cryo element resistance	10%	35%	75%	100%

The monsters in this problem have the following element affected states:
None, Pyro, Hydro, Dendro, Electro, Anemo, Cryo, Geo, Frozen.

Casting a Cryo attack of a monster in Hydro state will immediately change the monster into Frozen state and then deal to damage. Use Cryo attacks to monster in Frozen state will still keep monster in Frozen state. Use Cryo attacks to monster in other state will immediately change the monster into Cryo state and then deal to damage.

Artifacts

There are five kinds of artifacts in Genshin Impact for each part of the character:
Flower of Life, Plume of Death, Sands of Eon, Goblet of Eonothem, Circlet of Logos.

You can equip five parts of your character with these Artifacts, but remember that you can only equip only one Flower of Life , one Plume of Death, one Sands of Eon one Goblet of Eonothem and one Circlet of Logos. For example.you can't equip two Flower of Life for your character.

There are multiple set of the Artifacts.
Equipping 2 or more items and 4 or more items in the same set of artifacts will trigger the set bonus. Each artifact exist 5 attributes. The possible attributes are following:

Numerical_HP_Bonus, Percentage_HP_Bonus, Numerical_ATK_Bonus, Percentage_ATK_Bonus, Numerical_DEF_Bonus, Percentage_DEF_Bonus, CRIT_DMG, CRIT_Rate, Pryo_ATK_Bonus, Cryo_ATK_Bonus, Hydro_ATK_Bonus, Electro_ATK_Bonus, Anemo_ATK_Bonus, Geo_ATK_Bonus, Elemental_Mastery, Energy_Recharge.

Except for the attributes that begin with "Numerical" and the Elemental Mastery, all attributes are percentage bonus.

In this problem, we only considerate following two sets of artifacts:

Wanderer's Troupe

category	Flower of Life	Plume of Death	Sands of Eon	Goblet of Eonothem	Circlet of Logos
name	Troupe's_Dawnlight	Bard's_Arrow_Feather	Concert's_Final_Hour	Wanderer's_String_Kettle	Conductor's_Top_Hat

2-piece set bonus: Increases Elemental Mastery by 80.

4-piece set bonus: Increases Charged Attack DMG by 35% if the character uses a Catalyst or a Bow.

Blizzard Strayer

category	Flower of Life	Plume of Death	Sands of Eon	Goblet of Eonothem	Circlet of Logos
name	Snowswept_Memory	Icebreaker's_Resolve	Frozen_Homeland's_Demise	Frost-Weaved_Dignity	Broken_Rime's_Echo

2-piece set bonus: Cryo DMG Bonus +15%

4-piece set bonus: When a character attacks an opponent affected by Cryo, their CRIT Rate is increased by 20%. If the opponent is Frozen, CRIT Rate is increased by an additional 20%.

In each test case, give you some artifacts and tell you what monster Ganyu faced, please calculate the expected damage for a charged attack.

Promised that the artifacts in input data are legal.

Input

There are multiple test cases.

For each test case:

The first line contains a integer $n(n \leq 5)$, denoting the number of artifacts.

The second line contains a string indicate the monster name.

The third line contains a integer $l(1 \leq l \leq 120)$ indicate the monster level.

The fourth line contains string indicate the monster state.

Then for each artifact, first give you the artifact's name in one line.

Then for the next 5 lines, each line begin with a string denoting the attribute of the artifact, then following one integer $x(x \leq 10000)$, denoting the bonus of this attribute. If the attribute is percentage bonus, x indicates the real bonus multiply 1000(For example, if the attribute is CRIT Rate increased by 20%, than the value in input data is 200).

The number of test cases is less than 10^5.

Output

For each test case, print the value of expected damage for a charged attack in one line. Round up to integer.

Sample Input

```
5
Hilichurl
81
Anemo
Snowswept_Memory
Numerical_HP_Bonus 4780
Numerical_DEF_Bonus 44
Percentage_ATK_Bonus 82
CRIT_Rate 62
CRIT_DMG 132
Icebreaker's_Resolve
Numerical_ATK_Bonus 311
Elemental_Mastery 23
CRIT_DMG 272
Numerical_HP_Bonus 448
Percentage_ATK_Bonus 58
Frozen_Homeland's_Demise
Percentage_ATK_Bonus 466
Percentage_DEF_Bonus 117
Elemental_Mastery 175
CRIT_Rate 66
Numerical_ATK_Bonus 24
Frost-Weaved_Dignity
Cryo_ATK_Bonus 466
Numerical_ATK_Bonus 18
CRIT_DMG 140
Percentage_DEF_Bonus 131
Percentage_HP_Bonus 204
Broken_Rime's_Echo
CRIT_DMG 622
Percentage_ATK_Bonus 117
Numerical_DEF_Bonus 42
Numerical_HP_Bonus 299
Numerical_ATK_Bonus 53
```

Sample Output

```
19721
```

C. Back

There are N villages and M roads. If there is a road between two villages, they are directly reachable. If two villages are not directly reachable, they can first go to other directly reachable villages and then reach each other. We guarantee that there is at most one road between two villages, and each road is two-way, and any two villages can be reached. SDZ likes walking after dinner, **but he doesn't like to walk twice on the same road.** He wondered whether there was a route, and he set off along this route, and eventually he could return to the starting point without the road being repeated.

Input

There are two numbers N and M in the first line, which means there are N villages and M roads.($1 \leq N \leq 1000, 1 \leq M \leq \frac{N \times (N-1)}{2}$)

In the next M line, each line has two numbers u, and v indicates that there is a road between village u and village v.

Note that there are multiple sets of inputs and the sum of N is not more than 5000 and the sum of M is not more than 1000000.

Output

If such a route can be found, output `Yes`, otherwise output `No`.

Sample Input

```
1 1
1 1
```

Sample Output

```
Yes
```

D. Move The Numbers

John has learned **data structure and algorithm** course this semester, and he has a problem in the latest problemset that he desperately needs your help.

Given a permutation $a_1, a_2, \cdots, a_n$ of $1, 2, \cdots, n$, and the position of the elements will be adjusted m times.

Each adjustment specifies a index k, which means to adjust the array with following operation:

- First, append all numbers before the k-th number to the end of the array in order.
- And then, delete all numbers before the k-th number.

Your task is to find the final permutation after m operations.

Input

There are multiple test cases in this problem, and the input of each test case are as following statement:

In the first line of each test case, there are two integers n and m ($1 \leq n, m \leq 10^5$) , representing the number of elements in the array and the adjustment times correspondingly.

In the second line of each test case, there is a permutation $a_1, a_2, \cdots, a_n$ of $1, 2, \cdots, n$, representing the original permutation.

And in the last line of each test case, there are m integers, representing the index $k(1 \leq k \leq n)$ of each adjustment.

It is guaranteed that the sum of n over all test cases does not exceed 2×10^5, and the sum of m over all test cases also does not exceed 2×10^5.

Output

For each test case, output one line which contains n integers (separated by a space), representing the final permutation after m operations.

Sample Input

Sample Output

```
4 5 1 2 3
1 2 3 4 5 6
```

E. A Similar Game

This question is similar to Move The Numbers.

A permutation of size 2^n is an array of size 2^n such that each integer from 1 to 2^n occurs exactly once in this array.

An inversion in a permutation p is a pair of indices (i, j) such that $i > j$ and $a_i \leq a_j$. For example, a permutation $[4, 1, 3, 2]$ contains 4 inversions: $(2, 1), (3, 1), (4, 1), (4, 3)$.

You are given a permutation a of size 2^n and m queries to it. Each query is represented by one number $t(0 \leq t \leq n)$ denoting that you have to reverse the segment $[1, 2^t], [2^t + 1, 2 \times 2^t], [2 \times 2^t + 1, 3 \times 2^t], \cdots, [2^n - 2^t + 1, 2^n]$ of the permutation.

For example, if $a = [1, 2, 3, 4, 5, 6, 7, 8]$ and a query $t = 1$ is applied, then the resulting permutation is $[2, 1, 4, 3, 6, 5, 8, 7]$.

After each query you have to answer the number of inversions.

Input

There are multiple test cases in this problem. $(T \leq 12)$

In each test case, The first line contains two integers n and m. $(2 \leq n \leq 17, 3 \leq m \leq 10000)$.

The second line contains 2^n integers $a_1, a_2, \cdots, a_{2^n} (1 \leq a_i \leq 2^n)$ — the elements of the permutation. These integers are pairwise distinct.

The third line contains m integers $t_1, t_2, \cdots, t_m (0 \leq t_i \leq n)$.

Output

For each testcase print m lines denoting the answer.

Sample Input

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

Sample Output

```
4
6
6
2
4
2
```

F. It is Quite Big

It was such a breaking news, which was spread among the high schools in our county like crazy.
Let me be clear first. I'm a junior, actually I used to be a weeaboo but now I rarely watch anime. Playing weeaboo games would be the furthest I

can get. My classmate of junior high school, who started to watch animate together with me. now is in the very next class. We also often eat out and play together. There is a stupid weeaboo in his class. He watches anime and plays games every day in class, his grades are always the bottom in the class. I heard from my friend that he charged Arknights over tens of thousands yuan. Since there were very few people in his class who entered the house, he clung to my friends and often came in when we were eating together. But my friend and I have always disliked him. He often brags in front of us about what he has gotten while we don't have this one, we also like to belittle other animes, without caring about our feeling at all. To belittle our favorite character.His character still has problems. He also has a poor reputation in his own class and has few friends.

At the beginning of last month, during the National Day holiday, he played Genshin Impact and charged 30,000 yuan. However, he was still not satisfied since the role was not full. He went to steal money and was caught by his father just on shot. He fought with his father and finally he took away fifty thousand and went back to school. Let me just say that my school is a full-time boarding school, with half-day holidays every Saturday and 2-3 days off at the end of each month. Then here is the things. When he returned home at the end of October, he found that his parents were not at home, only his sister was at home and his sister is playing The Legend of Zelda . He forced his sister playing Genshin Impact and threatened her not to tell her parents. At the beginning of this month, when he returned to school for lunch at the beginning of the month, he told us that his sister must be a mihoyo fans and she must like Keqing, so he force her playing genshin impact, even explained the details. At the time, my friend and I did not believe it. By the way, his sister was just 12.

At about 10 o' clock the day before yesterday, his parents probably knew that he had forced his sister, so they ran to school and broke his leg on the spot. But he still said he would fight with his father till the last. At that time, many people recorded it and sent it to various high school chat groups. All high schools in our county knew about this incident, although the school has suppressed the news. Our school also spent half a day telling us not to spread the incident.

Anyway, they finally called up to the police. I don't know what happened later, all I want to tell you is just stop being a weeaboo as soon as possible, do not become a person like him.

Now let we assumed $n = \prod_{i=1}^{m} p_i^{k_i}$, and p_i are distinct prime numbers, $\Omega(n) = \sum_{i=1}^{m} k_i$, $\sigma(n) = \sum_{d|n} d$. Give you a postive number n, please calculate:

$$F(n) = \sum_{k=1}^{n} \sum_{d|k} (-1)^{\Omega(d)} \sigma(\frac{k}{d}) \pmod{998244353}, 1 \le n \le 10^{18}$$

Input

The first line contains an integer t ($1 \le t \le 100$) — the number of test cases.

For each test case, there is only one line contains an integer n ($1 \le n \le 10^{18}$).

Output

For each test case, print a single line containing an integer indicate of answer module 998244353.

Sample Input

```
3
23333
233333
2333333
```

Sample Output

```
294638140
514198163
505851636
```

G. IDEA's Tree

IDEA has a tree with $n(1 \le n \le 5000)$ nodes. Now she select a connected subgraph on the tree randomly, please help her calculate the expected size of connected subgraph she select (module 998244353).

Input

There are multiple test cases.

For each test case, in the first line, there is an integer n, denoting the node number of the tree.

Then for the next $n - 1$ lines, i-th line contains an integer u, indicate that there is an edge between $i + 1$ and u.

Output

For each test cases, print the answer in one line.

Sample Input

```
3
1
1
```

Sample Output

```
665496237
```

H. A Simple Game

This quesiton is very simple.This quesiton is very simple.This quesiton is very simple.

Alice and Bob play a game. Initially they have n cards. They take alternating turns, and Alice is moving first.

During each turn, the player will choose a certain card and get points. If Alice chooses the i-th card, her score will be increased by a_i. If Bob chooses the i-th card,his score will be increased by b_i. Each card can only be choosed by one player. The game ends when all cards are choosed.

Whoever gets a higher score, wins. You have to determine who wins if they both play optimally.

Input

There are multiple test cases in this problem.

In each test case,the first line contains one integer $n(1 \leq n \leq 10^5)$. The second line contains n space-separated positive integers $a_i(1 \leq a_i \leq 10^9)$. The third line contains n space-separated positive integers $b_i(1 \leq b_i \leq 10^9)$.

Output

For each test case print `Alice` if Alice can win and `Bob` if Bob can win.

If they get the same score,print `AEMSHANA` .

Sample Input

```
3
1 2 3
4 5 6
2
1 8
9 1
2
3 5
4 1
```

Sample Output

```
Bob
AEMSHANA
Alice
```

I. A Small Game

This is a simple question. This is a simple question.This is a simple question.

You are given four integers N, A, B and C.

Now you have a integer K ($K = 0$ initially).

Each time you can choose one of the following operations:

1. Cost A and gain $K + 1$ ($K \rightarrow K + 1$)
2. Cost B and gain $K \times 2$ ($K \rightarrow K \times 2$)
3. Cost C and gain $K - 1$ ($K \rightarrow K - 1$)

Find the minimun cost to get N.

Input

There are multiple test cases in this problem.$(T \leq 10^5 + 5)$

In each test case,there is only one line contains four integers $N(1 \leq N \leq 10^9)$, $A(0 \leq A \leq 10^9)$, $B(0 \leq B \leq 10^9)$, $C(0 \leq C \leq 10^9)$.

Output

For each test case print one line for the minimun cost to get N.

Sample Input

```
1 0 0 0
10 1 10 1
10 1 0 10
10 10 0 1
```

Sample Output

```
0
10
2
12
```

J. A Special Game

"Largest Rectangle in Histogram" problem is a classic problem. You are given an array of integers where each element represents the height of a bar in a histogram. A histogram is a graphical display of data using bars of different heights. The bars are placed in the exact same sequence as given in the array, and each of them has width 1. You need to find the area of the largest rectangle in the histogram.

But now Alice and Bob want to play a game on a histogram.They take alternating turns, and Alice is moving first.

Initially all cells are empty.During each turn, the player chooses three numbers:

$i, j, k(1 \le i \le n, 1 \le j \le a_i - k, 0 \le k \le 3)$, then paints the following cells:$(i, j), (i, j + 1), (i, j + 2) \cdots (i, j + k)$. Remeber these cells must be empty area that has not been painted before.
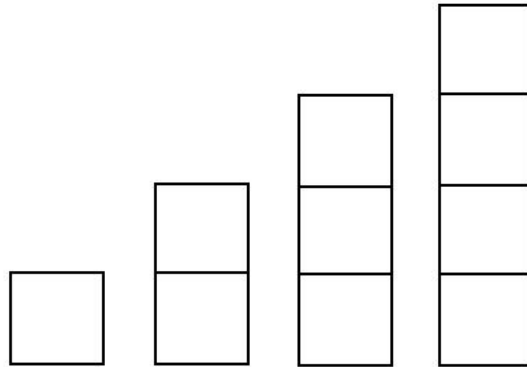
On the next turn another player does the same, then the first one and so on. The player with no cells to paint on his turn loses.

You have to determine who wins if they both play optimally.

Input

There are multiple test cases in this problem.$(T \le 100)$

In each test case,the first line contains one integer n denoting the width of histogram$(1 \le n \le 10^4)$.

The second line contains n space-separated positive integers a_i denoting the height of the i-th rectangle$(1 \le a_i \le 10^6)$.

Output

For each test case print `Emo:?` if Alice can win and `lets see who is real evil genius` if Bob can win.
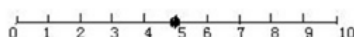
Sample Input

```
2
1 1
1
4
1
5
1
9
3
15 16 17
3
1000000 1 2
```

Sample Output

```
lets see who is real evil genius
Emo:?
Emo:?
Emo:?
Emo:?
lets see who is real evil genius
```

K. AEMShana loves games！

AEMShana loves playing video games.Recently he finds a Barrage game called Touhou Project.

Just like the picture above, AEMShana was born in the middle of a 10-meter-long street at time zero. AEMShana can only move one meter each second. Of course, he can stay where he is. For example, AEMShana can stay at 5 or move to 4 or 6 at the first second. And the sky will fall two kinds of balls. When you catch the balls you will get or lose points. If you are in the place where the ball is when it hits the ground, then you catch it (Whether you want to catch it or not). You will get one point when you catch the white ball while you will lose one point when you get the black ball. To break the game record，AEMShana hacked the games, So he knows when and where the black or white balls hit the ground. Can you help AEMShana calculate how much point can he get in this game? The point is zero at first and it can be negative(like -1).Remember that there may be many balls hit at the same time and place.

Input

There are multiple test cases in this problem.

In each test case, there is $N + 1$ line, the first line contains an integer N and each after N lines contains integers t, p, k which means the time when the balls hit the ground, the place where the balls hit the ground and the kind('0' is white ball and '1' is black ball) of the balls hited the ground.$(1 \leq N \leq 10^6, 1 \leq t \leq 10^5, 0 \leq p \leq 10)$

Output

Print the highest point that AEMShana can get in this game.

Sample Input

```
6
1 5 0
2 0 0
2 10 1
5 9 0
3 7 0
4 8 1
3
1 5 1
1 4 1
1 6 1
```

Sample Output

```
2
-1
```