Problem A. International Shipments

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Mohamed is employed at an international shipping company, where each shipment is entrusted to a reliable employee for delivery.

Mohamed has been provided with a list of K cities that he needs to visit. His manager has informed him that he can delegate L cities to be visited by another employee.

With the flights' table at hand, Mohamed seeks assistance in determining the minimum number of stops required to visit all $K - L$ cities. It's important to note that the source and destination should not be counted as stops. Additionally, the flights are considered undirected, meaning that if Mohamed can travel from city U to city V in X stops, he can also return from V to U in the same number of stops.

Input

The first line contains a single integer T, the number of test cases.

The next line contains 3 integers N, M, S - The number of cities, the number of flights, and the number of Mohamed's city.

Each of the following M lines contains 2 integers X and Y, which represent a flight from city X to the city Y, and from Y to X.

The next line contains 2 integers K and L ($L \leq K \leq N$).

The last line contains K distinct space-separated integers ($1 \leq A_i \leq N$), cities in Mohamed's list.

Output

For each test case print a single integer, the minimum total number of stops.

Scoring

Subtask #1 (30 points): ($1 \leq S \leq N \leq 3$) ($1 \leq M \leq 3$)

Subtask #2 (70 points): ($1 \leq S \leq N \leq 10^4$) ($1 \leq M \leq 2 * 10^4$)

Example

standard input	standard output
2 4 3 1 1 2 2 3 3 4 2 0 3 4 4 3 1 1 2 2 3 3 4 2 1 3 4	6 2

Note

IMPORTANT NOTE: When Mohamed visits a city, he must return back to the source city.

For the first test-case:

Mohamed will go from 1 to 3: with one stop at 2

from 3 to 1: with one stop

from 1 to 4: with two stops

from 4 to 1: with two stops

total cost $1 + 1 + 2 + 2$

Problem B. Courses

Input file:	`standard input`
Output file:	`standard output`
Time limit:	7 seconds
Memory limit:	256 megabytes

Given N courses numbered from 1 to N. Some courses have prerequisites, that is if course number U is a prerequisite of course number V then you must finish course number U before taking course number V.

Given the number of courses and the prerequisites, no course is prerequisite of itself, and no prerequisites will be mentioned in input more than once.

Your task is to print any valid order of taking the courses or state if the is no valid order.

Input

The first line will contain T the number of test cases.

Each test case will start with two space-separated integers N and M $(0 \leq M \leq min(N^2, 10^5))$

Then M lines follow, each line contains two space-separated integers U and V $(1 \leq U, V \leq N)$ which means course number V has a prerequisite of course number U, so you must finish U before V.

Output

For each test case, print a N numbers; a valid order of courses. If there is more than one solution print any of them.

Scoring

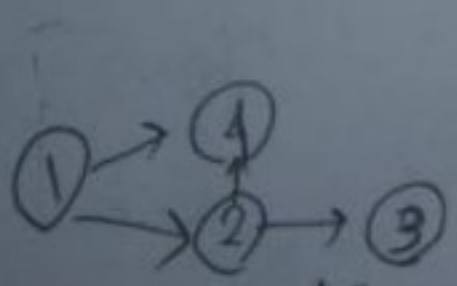
Sub task #1 (20 points): $(1 \leq T \leq 4)$ $(1 \leq N \leq 3)$

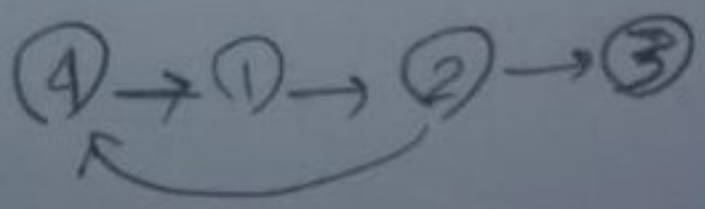
Sub task #2 (60 points): $(1 \leq T \leq 30)$ $(1 \leq N \leq 500)$ It's guaranteed that there is always a valid order

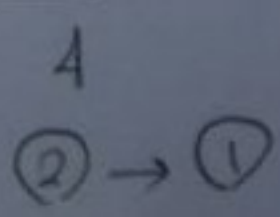
Sub task #3 (20 points): $(1 \leq T \leq 40)$ $(1 \leq N \leq 10^5)$ Print 1"if there is no valid order

Example

standard input	standard output
3 4 4 1 4 1 2 2 3 2 4 4 4 4 1 1 2 2 3 2 4 4 1 2 1	1 2 3 4 -1 2 1 3 4







Problem D. Grid

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Given a $N \times M$ grid and K diamonds located on it.

You want to reach (N, M) starting from $(N, 1)$.

You can only move from (i, j) to $(i, j+1)$,$(i+1, j+1)$, or $(i-1, j+1)$.

Find the number of ways to collect all diamonds module $10^9 + 7$.

Every diamond will be located at $G_{i,j}$

Input

The first line contains three numbers N, M, and K $(0 \leq K \leq N \times M)$

The second line contains K lines every line contains two integers (x, y) – the diamond location

Output

Find the number of ways to collect all diamonds module $10^9 + 7$.

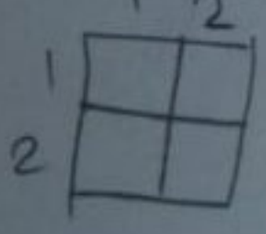
Scoring

Sub task #1 (30 points): $(1 \leq N \times M \leq 25)$

Sub task #2 (70 points): $(1 \leq N \times M \leq 10^6)$

Examples

standard input	standard output
2 2 1 2 1	1
3 3 2 3 1 3 3	2



Problem E. Omar and The Abandoned Factory 2

Input file:	standard input
Output file:	standard output
Time limit:	1 second
Memory limit:	256 megabytes

Omar found an abandoned factory, when he entered it he found N cool items. He wants to sell them to gain as much profit as he can. Each item has its own price p_i and weight w_i. Omar cannot carry items with the total weight greater than K.

Omar noticed that each unit of weight costs him 1 unit of profit in gas, so calculate the total profit after subtracting the cost.

Omar wants to know what maximum profit he can gain, can you help him?

Input

The first line contain the number of test cases.

Every test case consists of $N + 1$ lines. The first line contains 2 integers N and K ($1 \le K \le 10^3$) — the number of items and the weight limit.

Each line of the next N lines will contain 2 integers w_i and p_i ($1 \le w_i, p_i \le 10^3$), the item's weight and price

Output

for each test case print a line containing the maximum total profit

Scoring

Sub task #1 (30 points): $(1 \le N \le 25)$

Sub task #2 (70 points): $(1 \le N \le 10^3)$

Example

standard input	standard output
1 5 50 5 30 10 60 15 100 10 60 30 120	210

Note

In the test-case, The optimal answer is to take the first 4 items, he will get total profit of 250, but will also lose 40 of the profit and spend it on gas, so the net is 210.

Problem G. Complex Formula

Input file:	standard input
Output file:	standard output
Time limit:	1 second
Memory limit:	256 megabytes

You are given integer N, can you count the number of positive integer tuples X, Y, and Z that can be formed to satisfy this equation $3X + Y * 7Z = N$.

Input

In the first line, you will be given an integer N

Output

Print one integer the count of the valid positive integer tuples X, Y, and Z that satisfy the formula.

Scoring

Sub task #1 (30 points): $(1 \leq N \leq 10^3)$

Sub task #2 (30 points): $(1 \leq N \leq 10^4)$

Sub task #3 (40 points): $(1 \leq N \leq 10^6)$

Example

standard input	standard output
20	2

$3X + Y * 7Z$

$3X + Y * 7Z = N$

$3X = N - (Y * 7Z)$

$X = \frac{N - (Y - 7Z)}{3}$

Problem H. KOR

Input file:	standard input
Output file:	standard output
Time limit:	2 seconds
Memory limit:	256 megabytes

Given array A of size N Find the number of pairs (A_i, A_j) where $1 \leq i \leq j \leq N$ that the bitwise XOR of the two elements is equal to the bitwise OR such that $(a_i \oplus a_j) = (a_i | a_j)$, where $\oplus$ denotes the bitwise XOR and $|$ denotes the bitwise OR.

Note that two pairs are considered **different** if they don't have the same indices, for example, $(1, 3)$ and $(1, 4)$ are distinct, but $(1, 3)$ and $(3, 1)$ aren't.

Input

In the first line, you will be given an integer N the size of the array A.

In the second line, you will be giving N integers the elements of the array A.

Output

Output a single integer the number of pairs that the bitwise XOR of the two elements is equal to the bitwise OR.

Scoring

Sub task #1 (30 points): $(1 \leq N \leq 10^4)$, $(1 \leq A_i \leq 2^{10})$

Sub task #1 (30 points): $(1 \leq N \leq 2 * 10^5)$, $(1 \leq A_i \leq 2^{10})$

Sub task #2 (40 points): $(1 \leq N \leq 2 * 10^5)$, $(1 \leq A_i \leq 10^6)$

Example

standard input	standard output
4 4 5 10 10	4