The Vinny Chronicles

CLASSIFIED MATERIALS OF THE NUTT RECORDS

Vinny C, an aspiring computer science student, travels to Nutt Island with his friends Vinny G, Vinny Z, Hinny B, Vinny E, and Zinny P. The Vinnies are a group of outcasts waiting to shine at the Nutt Academy on Nutt Island, the only academy they could get accepted into. The Nutt academy is led by the Grand Emperor Dictator Nutt, who rules the island with an iron fist. Upon arrival at the island, the Vinnies are tested by Nutt and deemed as unworthy of his teachings. The Vinnies are sentenced to imprisonment on Nutt Island and have vowed to escape the harsh dungeons of Nutt's Castle. Astonishingly, in a miraculous sequence of events, Dungeon Master McMurry betrays the Emperor and allows the Vinnies to escape with him from the castle. Nutt Island is vast, and the journey through it is treacherous. Nutt, using CCTV cameras, watches as the Vinnies and McMurry escape. Grand Emperor Nutt prepares himself, as the battle has just begun...

Chapter 1: Words on the Wall

Problem Description: The Vinnies are trapped in Emperor Nutt's dungeon prison cell. They feel like they've spent an eternity rotting away... It had only been fifteen minutes. The Vinnies, bored out of their minds, decide to pass their time in the dungeon cell by writing on the walls with a piece of (what they hope is) chalk. The problem is, they have already begun to lose their sanity. So, as they write the words on the wall, they cut off more and more letters until they can no longer remember any of the letters.

Input Description: A single line containing one word.

Output Description: Print out the modified word.

Sample Input:
```
Stroudonia
```

Sample Output:
```
StroudoniaStroudoniStroudonStroudoStroudStrouStroStrStS
```

Chapter 2: Box Escape

Problem Description: While the Vinnies were busy writing on the prison cell walls, Dungeon Master McMurry came by and dropped off the group's rations for the day in the cell. However, the food was mysteriously placed in cardboard boxes. The Vinnies used their quick thinking and determined that they would stack the boxes to escape through a vent high up on the wall!

Input Description: The input will contain a single integer, $1 \leq \mathbf{N} \leq 25$, representing the number of boxes to stack.

Output Description: Print out **N** boxes according to the pattern shown in the sample output.

Sample Input:

```
3
```

Sample Output:

```
  XXXX
 X  XX
XXXX X
X..X XXXX
X..XX  XX
XXXX  X X
XXXXXX  X
X....X  X
X....X  XXXX
X....X X  XX
X....XX  X X
XXXXXX  X  X
XXXXXXXX   X
X......X   X
X......X   X
X......X   X
X......X  X
X......X X
X......XX
XXXXXXXX
```

Chapter 3: The Passcode Is…

Problem Description: Emperor Nutt has invented quite a complex system to create the locks that stop prisoners from escaping the dungeon: each number (not necessarily a single digit) in the passcode comes from calculating a power tower that can be rather tall.

Input Description: The first line will contain a single integer $1 \leq \mathbf{N} \leq 1{,}000{,}000$ describing the length of the passcode.

The following **N** lines will begin with an integer $1 \leq \mathbf{L} \leq 100$ describing the height of the power tower and each integer $1 \leq \mathbf{L}_i \leq 1{,}000{,}000$ describing a level of the power tower.

Output Description: Print **N** lines each with a single integer representing the nth number in the passcode.

The integer might be very large so use MOD 1000000007 and it may be necessary that you use a Long or BigInteger.

Sample Input:

```
2
2  3  2
3  2  2  2
```

Sample Output:

```
9
16
```

Output Explanation:

$3^2 = 9$

$2^{2^2} = 2^4 = 16$

Chapter 4: The McMurry Code

Problem Description: After escaping their cells, the Vinnies are confronted by the Dungeon Master. Several Vinnies gasped when he pulled his hood back. Vinny C even fainted. It was McMurry, and he was here to help the Vinnies escape!

McMurry led the Vinnies past all sorts of traps and into a large chamber containing Emperor Nutt's pride and joy, the Magical Prism. To progress past the chamber, they need to solve the word search on it! However, Emperor Nutt was not always fair when constructing the word search. It seems the words they are being told to look for sometimes aren't there!

The prism will contain letters to words from left to right on odd number rows and right to left on even number rows. The letters to words may wrap around between rows, and they will only have to search rows from top to bottom.

Input Description: The first line contains an integer describing the number of test cases to follow.

The first line of each test case contains an integer **N** representing the number of words to search for. The next **N** lines contain the words to search for.

The next line of each test case contains an integer **S** representing the number of rows in the prism. The following **S** lines contain the rows of the prism.

Output Description: If all words were found, output "All words found!" Otherwise, output "Unsolvable. Not fair!"

Chapter 4: The McMurry Code Cont.

Sample Input:

```
2
2
NUTT
LAND
6
     N
    T U
   T U A
  N L T A
 A D N A L
L A D N A L
1
STROUDONIA
2
 A
B C
```

Sample Output:

```
All words found!
Unsolvable. Not fair!
```

Output Explanation:

```
     N       ->
    T U      <-
   T U A     ->
  N L T A    <-
 A D N A L   ->
L A D N A L  <-
```

The prism contains both the words NUTT and LAND.

Chapter 5: Untimely Trap

Problem Description: After exiting the chamber and putting Emperor Nutt's lock creation skills to shame, McMurry led the group to the next room. It contained a massive abyss, the sheer square footage of which makes the mortgage for the dungeon a nightmare. To get across, the Vinnies first need to take a small walkway raised along the edge with a piston trap secured to the wall. McMurry informed the Vinnies it was Emperor Nutt's prized Mega Piston™ that would knock people right into the abyss.

Through extensive observation, the Vinnies noticed that the amount of time they had to cross from one side of the Mega Piston™ to the other varied. Specifically, a crossing time **t** has a probability **p** of occurring. Using their AP Statistics knowledge (the Vinnies all got 5's on the AP exam), they try to calculate the expected **E(X)** crossing time they have to make it to the other side of the Mega Piston™.

$$E(X) = \sum_{i=0}^{n} t_i \, p_i$$

Input Description: The first line contains an integer 1 ≤ **N** ≤ 50, the number of different crossing times the Vinnies observed.

The next **N** lines contain 2 real numbers 0 < **t** ≤ 10 and 0 < **p** ≤ 1, representing a crossing time and the probability of the crossing time occurring, respectively. It is guaranteed that the sum of all p will be equal to 1.

Output Description: Print out the expected crossing time to the nearest hundredths place.

Sample Input:

```
3
1.25 0.5
2.25 0.25
4.15 0.25
```

Sample Output:

```
2.23
```

Chapter 6: Zipline Crossing

Problem Description: Now at the edge of the bottomless abyss, the Vinnies spot a set number of ziplines **Z** of a certain length **L** going over the edge. After ruling out all other possible escape methods, McMurry persuades the Vinnies to take the ziplines to escape. However, the Vinnies are not too convinced by the safety of the ziplines, as it seems they are broken in many spots along the way down. To escape using the ziplines, the Vinnies will need to change the line they are riding on to an adjacent one before reaching an unusable point, represented with a space.

In the time that the Vinnies are switching ziplines, they will have traveled a distance of 1 meter, meaning that both their current zipline and the adjacent one need to be active during this interval. The Vinnies cannot switch ziplines twice in one position.

```
123456789
----    --
   -----
```

In this example, the Vinnies can and have to switch ziplines at positions 4 and 8.

```
123456789
----    -
    ---
```

In this example, it is impossible to switch ziplines anywhere.

Input Description:

The first line contains an integer describing the number of test cases. The first line of each test case contains two integers $1 \leq \mathbf{Z} \leq 500$, and $0 \leq \mathbf{L} \leq 500$, the number of ziplines and the length of the ziplines, respectively. The next **Z** lines will contain an integer **N**, the number of closed intervals that the zipline is active, followed by **N** pairs of integers $1 \leq \mathbf{a} \leq \mathbf{b} \leq L$, the start and end position of each closed interval. All intervals will be ordered, and no intervals on the same line will overlap anywhere.

Output Description: For each test case, output 'YES' if it is possible to get to the end of the zipline and 'NO' if it is not possible.

Chapter 6: Zipline Crossing Cont.

Sample Input:

```
1
4 9
1 3 6
2 1 4 6 7
2 2 3 6 8
2 3 6 8 9
```

Sample Output:

```
YES
```

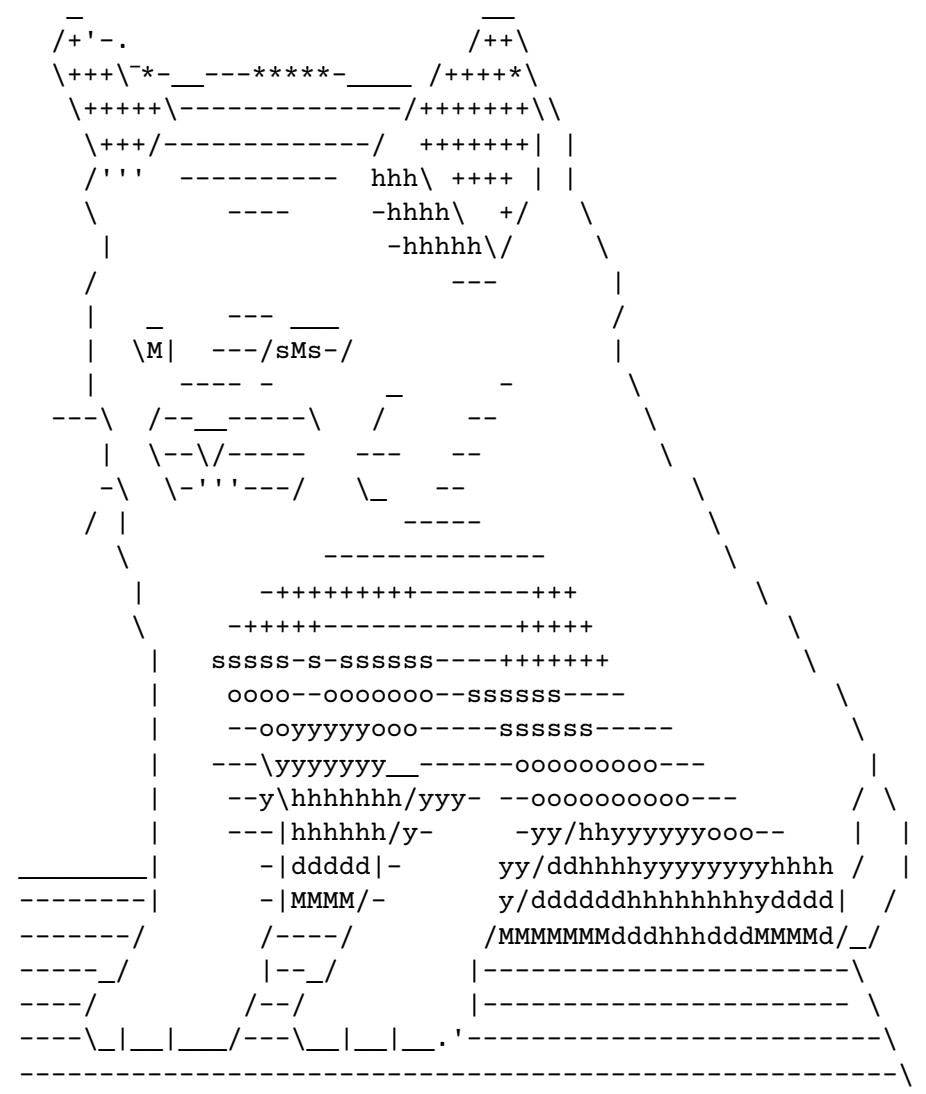
Output Explanation: To get to the end, start from zipline 2. At position 3 or 4, switch to 1. At position 6, switch to 2. (You cannot then switch to 3 at position 6). At position 7, switch to 3. At position 8, switch to 4.

```
  123456789
1   ----
2 ---- --
3  --  ---
4   ---- --
```

Chapter 7: Cute, Fluffy Kitten

Problem Description: Off in the distance, Zinny P sees a cute, fluffy kitten! Oh, how adorable the little thing is. It really makes one want to just go up and pet it.

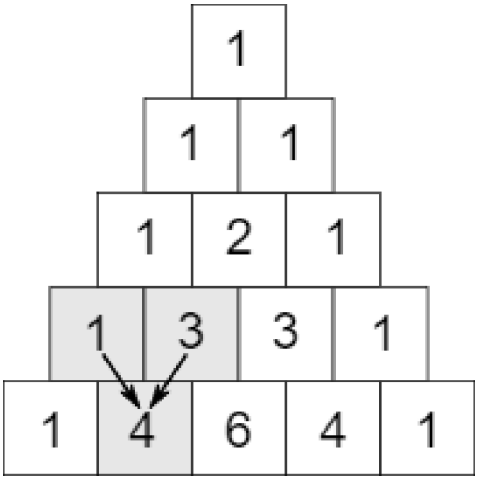
Output Description: Print out the following ASCII Art:



Chapter 8: Pascal's Dilemma

Problem Description: The Vinnies now realize that the trap junction is more devious than could have ever imagined. Some of the paths included a fire trap, floor spikes, and a magic dance floor that can result in a painful acid bath. Yet, by far the most despicable was the painting of the kitten, luring anyone wanting to pet it to fall into a bottomless pit. Forever rest in peace, Zinny P.

The Vinnies ultimately chose the dance floor, which had several numbers. This must be a reference to Pascal's Triangle (obviously). They now need to take the final row of the triangles and input it on the dance floor with their amazing dance skills.



Input Description: The first integer, $1 \le \mathbf{K} \le 33$**,** denotes the number of triangles. The following $1 \le \mathbf{K}_i \le 100$ represent the number of rows in a triangle.

Output Description: Print out the final row of each pascal's triangle on different lines. Only print the second occurrence of a value in a row (values that occur only once will not be printed).

Sample Input:

```
3 6 9 1
```

Sample Output:

```
15 6 1
126 84 36 9 1
1
```

Chapter 9: Wave Check

Problem Description: Now that the Vinnies have escaped the dungeon, Emperor Nutt needs to create a reliable method to track the Vinnies. The most economical idea he thinks of is to use **N** radars interspersed throughout the island. The radars can send messages between each other, so Emperor Nutt can check each radar from the comfort of his throne. It is not necessary that each radar can communicate with every other radar as long as there exists a path such that one radar can transmit its information to a different (possibly distant) radar. Additionally, these radars take time to transmit their wave signals.

The distance between one radar and another will be calculated using $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ and the wave signals will all travel at the same velocity **v (** $\frac{distance}{time}$ **)**.

Nutt wants to find out the minimum sum of the time it takes for wave signals to travel between one radar to another.

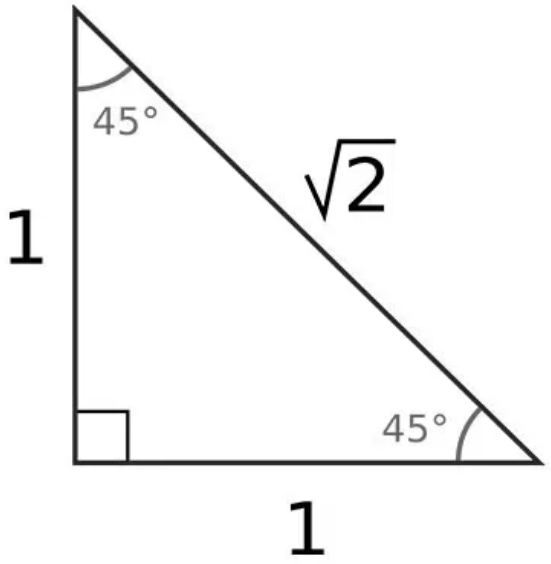
Input Description: The first line of input will contain an integer 2 ≤ **N** ≤ 5,000 and a real number 0 < **v** ≤ 250, the number of radars and the velocity of the wave signals.

The next **N** lines will contain 0 ≤ **x**, **y** ≤ 10000 representing the location of a radar - the **(x, y)** coordinates may not necessarily be integer values.

Output Description: Print a single number (3 decimal places only) representing the minimum total transmit time.

Sample Input:
```
6
```

Sample Output:
```
2.000
```



Chapter 10: Toppin' Trees

Problem Description: The Vinnies have finally escaped into the open air and travel into a forest, yelling "BAZINGA!" out of excitement. While leading the group, Vinny C comes across an old chainsaw. He decides to use the chainsaw to cut down **N** trees, preventing Emperor Nutt from easily tracking them! Unfortunately, the chainsaw is so old, it can only cut down only one more tree. The Vinnies want to find the optimal tree to cut down with the chainsaw. To do so, the Vinnies can travel along a series of paths that connect the trees. Each tree will be denoted by a single non-negative integer **T**. In the case there are multiple trees that could be cut down, the Vinnies would prefer to cut down the tree with the smallest integer.

Input Description: The first line will contain $2 \leq \mathbf{N} \leq 2500$ and $4 \leq \mathbf{M} \leq \mathbf{N^2}$, the number of trees and the number of paths, respectively.

The following **N** lines will contain 2 integers $1 \leq \mathbf{a}, \mathbf{b} \leq \mathbf{N}$, denoting that tree a is connected to tree b by a path and vice versa.

Output Description: Print a single integer denoting the most optimal tree to cut such that the maximum amount of paths will be blocked.

Sample Input:

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

Sample Output:

```
3
```

Chapter 11: It’s a Drone!

Problem Description: Hinny B was chasing birds around the forest, surprisingly managing to catch one. The bird landed with a loud thud, revealing that it was actually a drone! The Vinnies have been spied on this entire time! For their safety, the Vinnies now need to track down all the drones and destroy them. However, the Vinnies do not want to harm the birds as they are part of an animal conservation group. The only way for the Vinnies to differentiate between birds and drones is by the sound that they make. The birds can make any sound while the drones have the characters N, U, T, T (uppercase or lowercase) in this order in the sound.

Input Description: The first line of the input contains a single . The next **B** lines will contain a string representing the sound of the bird.

Output Description: Output “Bird” if the sound corresponds to that of a bird, and Output “Drone” if the sound corresponds to that of a drone.

Sample Input:

```
1
‘knutensd&knTjfufuksa&&lotkfmsankdiutens,’’7&’;
```

Sample Output:

```
Drone
```

Chapter 12: Wait for it!

Problem Description: Unable to track down and destroy all the drones in time, the Vinnies are chased out of their picnic area in the forest by Emperor Nutt. While running away, they stumble upon a forbidden temple full of arrows, and nominate Vinny E as the lucky trap-clearer.

Vinny E can only move 1 unit on the grid per unit of time, and he can only move forward directly towards the endpoint. Every unit of time that passes, the arrows move one unit in the direction they're facing. If an arrow reaches a wall, on the next unit of time, it will turn around and move in the opposite direction.

Once Vinny E starts moving forward, he can't stop moving and must move one unit forward every unit of time until he reaches the endpoint. Find the minimum units of time Vinny E must wait before starting to move to avoid being hit by any arrows and prevent Vinny E from gaining a few new orifices.

Input Description: The first line contains an integer describing the number of test cases. The first line of each test case contains two integers describing the number of rows and columns in the room. The following lines contain characters for the room.

```
# - Wall
. - Empty Space
S - Start
E - End
> - Right Arrow
< - Left Arrow
```

There will only be one arrow per line**.**

Output Description: Print out the minimum units of time Vinny E must wait before running across the room. Output the time for each test case on a separate line. There is guaranteed to be a possible solution.

Chapter 12: Wait for it! Cont.

Sample Input:

```
2
10 7
#######
#..E..#
#>....#
#.....#
#...<.#
#.....#
#.....#
#.>...#
#..S..#
#######
7 6
######
#.E..#
#....#
#>...#
#....#
#.S..#
######
```

Sample Output:

```
2
0
```

Chapter 13: hsilgnE… Please!

Problem Description: The Vinnies have lost their way, and now need directions from the signposts scattered around the island. Something is wrong, though: all of the signs are not written in English! It seems that Emperor Nutt created a new national language for his glorious island. The only language he could come up with, however, was hsilgnE -- English, but every word is reversed.

Until Google Translate supports hsilgnE, the Vinnies need to develop a fast way to decipher the language in order to navigate the island.

Input Description: There will only be one line of input containing the sentence that the Vinnies want to translate. The input will contain only letters and spaces with no punctuation.

Output Description: Print a single line containing the translated sentence.

Sample Input:
```
ttuN si eht tseb relur
```

Sample Output:
```
Nutt is the best ruler
```

Chapter 14: Smoke on the Water

Problem Description: Thanks to his wonderful array of radars, Emperor Nutt was able to track the Vinnies in their escape. He determined the Vinnies must be heading for the underground lake system on the island. In preparation, he decided to build flooring around the caverns and lake to put smoke machines on and disorientate the Vinnies.

A smoke machine can fill up an entire room of open space. A room is defined as a group of adjacent open spaces indicated by a "." and ends at a wall indicated by a "#". The following example has two rooms:

```
######       ######
#.##.#       #1##2#
#.#..# ---> #1#22#
#.##.#       #1##2#
######       ######
```

For every smoke machine, the price to buy them becomes exponentially larger. The price of a single smoke machine can be modeled by the following equation where **P** represents the price and ***x*** represents the number of open spaces in a room:

$$P = (1.05)^{x-1}$$

Determine the number of smoke machines Emperor Nutt will have to purchase as well as the total price of these machines.

Input Description: The first two lines contain integers 1 ≤ **N, M** ≤ 1,000 which represent rows and columns, respectively.

The next **N** lines contain **M** characters describing the floor plan of the dungeon.

Output Description: The first line contains the total number of smoke machines Nutt will have to purchase. The next line contains the total amount Nutt will spend on all his smoke machines, rounded to the nearest hundredths place.

Chapter 14: Smoke on the Water Cont.

Sample Input:

```
5 6
######
#.##.#
#.#..#
#.##.#
######
```

Sample Output:

```
2
$2.26
```

Chapter 15: Scuba Scam

Problem Description: The Vinnies are in a time crunch to escape the island before they are sent back to the dungeon for all eternity. They decided that they would use scuba gear to swim away, but the pawnshop scammed them and supplied **N** empty oxygen tanks. Thankfully, the Vinnies were able to convince **L** locals to refill the tanks, but the time **T** it takes for each local to refill one tank may vary.

Cautious of their limited time, the Vinnies want to calculate the minimum amount of time needed to refill all of their oxygen tanks.

Input Description: The first line will contain $1 \leq \mathbf{N} \leq 10^8$ and $1 \leq \mathbf{L} \leq 10^5$, the number of empty oxygen tanks, and the number of locals willing to help.

The second line will contain **L** integers describing the amount of time $1 \leq \mathbf{T} \leq 10^6$ it takes for a local to refill one tank.

Output Description: Print out a single integer describing the minimum amount of time required to refill all of the oxygen tanks.

Sample Input:

```
5 3
3 2 5
```

Sample Output:

```
6
```

Chapter 16: Radio Kaos

Problem Description: Vinny Z picked up some mechanical parts whilst escaping the underground lake. Luckily, he minored in engineering for a lengthy 5 days at a summer camp and was able to figure out a way to put the parts to good use. He can build a radio transmitter!

The Vinnies are in an area of length **L** containing trees. In order for the signal to properly carry, they need a continuous length where there are zero trees, but can only clear a maximum of **C** trees.

Find the largest possible area they can clear given they only have the time to clear a certain amount of trees.

Input Description: The first line contains an integer describing the number of test cases.

The first line of each test case contains two integers $1 \leq \mathbf{L} \leq 10^5$ and $1 \leq \mathbf{C} \leq 10^9$, the length of the land and the maximum number of trees the Vinnies can clear.

The next line contains **L** spaced integers $0 \leq \mathbf{L}_i \leq 1000$, the number of trees in one position.

Output Description: For each test case, print out a single line with the maximum continuous length that the Vinnies can clear given they can only clear a total of C trees.

Sample Input:

```
3
7 9
4 5 3 3 3 6 7
5 0
0 0 1 0 0
6 5
1 1 1 1 1 1
```

Sample Output:

```
3
2
5
```

Chapter 17: What's the Frequency, Vinny?

Problem Description: Along with changing the national language, Emperor Nutt has completely transformed the way computers work. Emperor Nutt, with his limited time (being the sole ruler of an island is tough work, you know?), changed the computers so the base they count in is different. Instead of binary like the Vinnies are used to, the computers operate in base **B**. To access the program they built for the radio transmitter, they first need a way to convert base **B** to binary.

Input Description: The first line of input will contain two integers $1 \leq \mathbf{N} \leq 20$ and $3 \leq \mathbf{B} \leq 16$, the number of phrases to convert to binary and the different base B.

The following **N** lines of input will contain phrases that may contain numbers or letters.

Output Description: Print out **N** lines where each line represents the given phrase in binary.

Sample Input:

```
2 3
011 101
222
```

Sample Output:

```
100 1010
11010
```

Chapter 18: Escape Nutt Island!

Problem Description: Despite being trapped on an island against their will, the Nuttrison® cell service company refuses to give them any sort of discount on their call. To send a call for help using their transmitter, the message will first be encrypted for end-to-end call protection. The Vinnies definitely don't want Emperor Nutt to know the specifics of the call, so they actually buy the premium encryption package, which costs extra, combined with the flat fee that is required. Determine the cost of the call so the Vinnies can finally send their message and escape Nutt Island!

Input Description: The first line contains $0 < \mathbf{N} \leq 100$, the number of test cases. The next line contains $1 \leq \mathbf{A} \leq 22$ and $0 \leq \mathbf{F} < 1000$, the number of encrypted characters and the flat fee, respectively. The next **A** lines each contain a unique encrypted character $1 \leq \mathbf{C} \leq 1000$ and its cost separated by a space.

The last line of each case is a string of characters, some encrypted and some not, that the Vinnies want to send through the encrypted messaging system. No cost is added for characters that are not encrypted. This format is repeated **N** times.

Output Description: For every case, print out the total cost, including the flat fee.

Sample Input:

```
2
4 15
$ 7
& 4
! 3
< 110
!H&<$V&N<$I!S!!!!!
3 7
% 3
( 4
* 5
F%%L(S*HM(RT%LS
```

Sample Output:

```
278 29
```