icpc international collegiate programming contest

Official Problem Set

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1. SHOP

Ahmad is shopkeeper working in a market. When a customer pays him for his shopping, he has to pay back the changes. Ahmad always wants to pay with the highest bills (if possible). Write a program to help Ahmad.

Input:

First line contains T the number of test cases (0 < T < 100). Each test case has two lines. First one is the amount M ($1 \leq M \leq 1000000$) that Ahmad should pay be to customer.

Second line contains $m_1:a_1,...,m_i:a_i,m_n:a_n$ ($1 \leq m \leq 1000000$), m_i is the money bill and a_i is the number of bills he has for each m_i.

Output:

Print the bills (sorted in descending) that Ahmad needs to pay back to the customers.

Example:

Input:

```
3
235
5:10,10:6,20:4,50:3
370
10:4,5:20,40:4,70:3,100:2,50:5
172
10:4,5:20,40:4,70:3,100:2,50:5
```

Output:

```
Customer1:
50 3
20 4
5 1
Customer2:
100 2
70 2
10 3
Customer3:
Impossible
```

2. TRIP

Wajed works as a driver in a software company. He is responsible for driving employees from/to their home to the company's main office. Every day he drives from the main office to the home of all employees to pick them up, then he takes them to the office. He should save time, and fuel, so he wants to find the best route to do this with the least cost. Your task is to find the shortest route that begins at the company, picks all the employees and returns back to the company's office.

Input:

The first line contains the number of test cases: 0 < T < 100. Each next T test cases begins with a line containing two integers: N, M, the number of intersections N (all numbered from 0 to N-1) and roads M in the city. The company is at the intersection numbered 0. M next lines each contains three integers X, Y, and D (0 <= X, Y, D <= 1000): the intersections X and Y are connected by a bidirectional road of length D. The following line contains a single integer S (1 <= S <= 10), the number of employees that should be gathered. The subsequent S lines each contain one integer indicating the intersection at which each engineer's home is located. It is possible to gather all the employees from the company.

Output:

For each test case, output a line containing a single integer, the length of the shortest possible trip from the company, gathering all the employees, and returning to the company.

Example:

Input:

```
1
4 6
0 1 1
1 2 1
2 3 1
3 0 1
0 2 5
1 3 5
3
1
2
3
```

Output

```
4
```

3. DUP

A software company started working on a utility software for detecting duplicate image files. Of course, one simple solution could be the comparison of the file name, extension, creation and modification date-time. But the result is not going to be accurate. To check if two images are duplicate their content should be compared (pixel to pixel comparison).

As a starting point, they want to add the functionality of comparing images with the same size and possibility of 90, 180 or 270 degrees rotation. Write a program that gets the image file name and its content as pixels matrix for input and lists the duplicate image names as output.

Input:

First line contains `I W H`

- `I` is the number of input images, `I < 1000`
- `W` is the image width, `0 < W < 100`
- `H` is the image height, `0 < H < 100`

Next, each image starts with:

- `FN` is a line which contains the file name, `len(FN) < 100`
- Next `W or H` lines each containing `W or H` number of characters (pixels)
  - Each pixel is represented by a single character (`0-9, A-Z, a-z, or +`)
  - The bottom-left pixel of the original image is marked with the plus [+] sign.

Images are separated with a line containing 5 dashes (-).

Output:

Print the name of duplicate images sorted alphabetically in ascending order each in one line.

Check the next page for an example.

Example:

Input:

```
3 4 3
untitled.png
345+
2344
3455
-----
trip2019.png
323
434
545
54+
-----
game.png
+10
210
351
445
```

Output:

```
trip2019.png
untitled.png
```

Description:

Based on the input, there are 3 images, each has a 4x3 or 3x4 dimension. In the table below each image is rotated back to 0 degrees and then compared.

File Name	untitled.png	trip2019.png	game.png
Input	345+ 2344 3455	323 434 545 54+	+10 210 351 445
Note	Originally the + sign should be in bottom-left, but because it is rotated +/-180 degrees it is now in top-right.	The image was rotated 90 degrees (or - 270).	The image is rotated 270 (or -90) degrees.
After Rotation	5543 4432 +543	5543 4432 +543	0015 1154 +234

So [untitled.png, and trip2019.png] are duplicate because they have the same content (pixels).

4. CHROM

A **chromosome** is a deoxyribonucleic acid (DNA) molecule with part or all the genetic material (genome) of an organism. However, in this problem we are interested in following definition of chromosome "a **chromosome** (also sometimes called a genotype) is a set of parameters which define a proposed solution to the problem that is trying to solve." The later definition of the chromosome can be referring as digital chromosome also. Moreover, unlike the human chromosome the digital chromosome can be crossover using different approaches to solve the optimization problems in many areas, especially in industries.

The city of Herat is known for its industries, there is a company whose job is to print card postal for stationary stores all over Afghanistan. The company has 10 machines for printing these cards. However, the problem is that different cards have different configuration and thus it needs to prepare the machine for printing the cards therefore they need to find the optimal permutations of orders to reduce the configuration time by putting same orders after each other. Additionally, they every order has quantities and deadline associated with.

The company asked you to help them to understand what sequence of orders they need to follow for printing more cards on limited time. To help company you need to search all possible permutations of the orders to get the best sequence of orders. However, the search space is huge, and it takes a long time to run. But we can crossover chromosome to get new offspring from two parents. The type of crossover they like to operate is described as following:

In order to generate new offspring, we need to have two parents of the same size but possibly different permutation (sequence orders). Every two parent crossovers using two randomly points selected from the length of chromosome. The offspring inherits all the sequences orders between the crossover points from the first parent at the same positions as first parent. Moreover, the new offspring inherits the rest from the second parent, starting from the second crossover points.

Check the next page for the input and output details.

Input:

First line contains the number of test cases (T): $1 \le T \le 1000$

Second line, two integer numbers n, m separating by space, indicating the first and second crossover points. $0 \le n, m \le$ length of chromosome -1. The first crossover point is included but not the second crossover point. The crossover points assumed the chromosome is stored in an array therefore, 0 represents the first elements of chromosome.

The third and fourth lines represent the two parent chromosomes. Chromosomes orders are separated by space.

Output:

A new offspring after crossover.

Example:

Input:

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

Output:

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

5. BNKQ

The Xyz Bank in Afghanistan is having trouble with their customer. Around the end of each month when government employees' salaries are deposited into their accounts, too many will come to withdraw money from their accounts. The bank has a problem with managing the counter queues. They want their customers to stay less time waiting in the queue. Write a program and help the bank with their problem.

Input:

The first line contains the number of test cases (T): $0 < T < 100$

- The next line contains the number of counters (C), and number of customers for the current test case (N) separated with space from each other:
  $0 < C < 10, 0 < N < 1000$
- Each next N lines contains a number (D) which is the number of minutes that current customer arrives into the bank after the previous one, separated with a whitespace from (W) which is an approximate number of minutes that will take to process that customer:
  $0 <= D < 30, 0 < W < 20$

Output:

For each test case, print the approximate number of minutes that it will take to process all customers.

Note:

- All counters work at the same speed.
- There is no delay other than the time gap between arrival of customers.

Check the next page for an example.

Example:

Input:

```
1
2 5
0 1
0 2
0 3
2 4
1 5
```

Output:

```
9
```

Description:

There is only one test case, which has 2 counters and 5 customers. Each customer has an approximate estimation about how long it will take to process her/his request. If we enqueue all of them into the counters, we will have the following order:

Counters\mins	1	2	3	4	5	6	7	8	9
Counter 1	1								
		3	3	3	5	5	5	5	5
Counter 2	2	2	4	4	4	4			

- [min1] => 1,2,3 arrives
    - 1 => 1st counter
      2 => 2nd counter
    - 3 => waits 1 min in 1st counter
- [min3] => 4 arrives (2 mins after 3)
    - 4 => 2nd counter
- [min4] => 5 arrives (1 min after 4)
    - 5 => waits 1 min in 1st counter

Each time a customer arrives s/he is added to the smallest queue. It will take 9 minutes to process all customers (from the first moment the first customer arrives, until the last one is processed).

6. LTBL

The Afghanistan League of Football has grown larger in the last few years. Ranking the teams in the league is a very important part of every league, and people want to understand what the current status of the league is. The league administration wants to create a website and publish the match result for public access. They need a program that can generate the data for the ranking table based on the match results. Write a program to help them with this problem.

Input:

First line contains the number of test cases (T): `0 < T < 1000`

Next line contains the number of matches (M): `0 < M <= 256`

Each next line contains the match result between two teams in this format:

- `team1 [team1_goals_count - team2_goals_count] team2`
  `0 < len(team[1 and 2]) < 100, 0 <= team[1 and 2]_goals_count < 20`
- `E.g.: Shahin [2 - 2] Hariwa`

Output:

Print the league table for each test case in the following format:

- `team-name,points,wins,draw,loss,goals-scored,goals-received`
  `E.g.: Shahin,12,3,0,0,10,2`

Separate each test case output with an empty line (no empty line after the last testcase result).

Note:

- A team wins if they score more goals than the other team
- A match is a draw if both teams score the same number of goals
- A team will receive 3 points for each win, 1 for each draw, and a 0 for each loss
- Sort the table based on points (higher first), number of wins (higher first), number of draw (higher first), number of loss (lower first), number of scored goals (higher first), and number of received goals (lower first)
- To teams can play multiple times with each other.
- Some teams may play more games than other teams, e.g.: in the left every team played 4 games. And in the right with the same number of teams, each played different numbers of games.

Check the next page for an example.
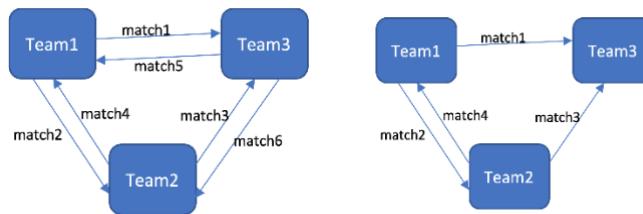
Example:

Input:

```
1
6
team1 [2 - 0] team3
team1 [1 - 1] team2
team2 [4 - 7] team3
team2 [0 - 0] team1
team3 [5 - 3] team1
team3 [6 - 1] team2
```

Output:

```
team1,5,1,2,1,6,6
team2,2,0,2,2,6,14
team3,9,3,0,1,18,10
```

Description:

Matches	Result			Goals scored			Goals received		
	team1	team2	team3	team1	team2	team3	team1	team2	team3
team1 [2 - 0] team3	won		loss	2		0	0		2
team1 [1 - 1] team2	draw	draw		1	1		1	1	
team2 [4 - 7] team3		loss	won		4	7		7	4
team2 [0 - 0] team1	draw	draw		0	0		0	0	
team3 [5 - 3] team1	loss		won	3		5	5		3
team3 [6 - 1] team2		loss	won		1	6		6	1
Total	Won	1		3	6			6		
	Draw	2	2			6			14	
	Lose	1	2	1			18			10

	points	win	draw	loss	scored	received
team1	5	1	2	1	6	6
team2	2	0	2	2	6	14
team3	9	3	0	1	18	10

7. HOMWRK

In one of the beautiful cities of Afghanistan two sisters are going to program a simple game to help them solve their mathematics homework. Their homework asks them to calculate the sum and multiplication of two numbers. Your task is to help them to build a simple program for their homework.

Input:

First line contains the number of test cases (T): $1 \leq T \leq 1000$

Second line represents the number of problems. $1 \leq N \leq 50$

Next N lines contains two integer numbers. $0 \leq number \leq 20000$

Output:

For every input expecting two integer numbers, first one represents the addition of two given numbers and second represents the multiplication separated by space.

Example:

Input:
```
1
2
20 30
40 60
```

Output:
```
50 600
100 2400
```

8. SENTI

In the last few years, the government of Afghanistan is looking to raise up satisfaction of Afghan citizens. They have found that people making many comments about their plans in Social Medias. However, it is hard for them to see all the comments. On the other hand, the people feedback has a significant impact on the government's future decisions. Afghan government knows that all the comments are either positive or negative. However, they have issue with negated words 'don't and is not'. Also, they know only 24% of entire comments have negated word included. However, the good news is that they already know what the positive words and negative words are. In general, they consider any comments to be negative if it has any negative words from negative vocabulary in the following list. Similarly, they classified as positive if it has any word from positive vocabulary.

- Positive vocabulary words: (Good, Nice, Like, Mashallah, Barakallah, Tashakor, Khobis, Popular).
- Negative vocabulary words: (Bad, Zesht, Lier, Manfi, Impossible, Mariz, Poor, Hunger).

Your task is to find a way to classify the negative and positive comments. Considering that Afghan government is giving you comments to be classified from 76% of comments which has not the negated words. Note that every comment is ended with a stop word (.).
Note no comments has both positive and negative words included.

Input:

First line contains the number of test cases (T): $1 \leq T \leq 1000$
Second line contains L, an integer $(1 \leq L \leq 30)$ shows the number of comments for tagging.
Next L lines contain the actual comments.

Output:

For every test case print the number of positive and negative comments.

Example:

Input:
```
1
3
I like it.
khili Khobish ast.
Mardom poor hastan.
```

Output:
```
Positive: 2, Negative: 1
```

9. DISPER

The university of "AAA" is interested to investigate and evaluate their performance of professors. They are interested to know who has the less consistency. For this purpose, the university needs to find an approach so that it considers the contribution of all marks of students over a single mark. The University found that the variance of the marks can help them find who has the less consistency. In general, the less consistency has the high dispersion. The highest mark a student can have is limited to 100, moreover, all students have exactly the same number of curses. Additionally, for any students who have missed the course the mark considered to be the lowest possible mark. Variance Formula:

In this formula x shows different mark, represents the mean value of mark. N stands for number of marks.

$$\sigma^2 = \frac{\Sigma(x - \mu)^2}{N}$$

Input:

First line contains the number of test cases (T): $1 \leq T \leq 100$

Second line indicates the number of professors to be evaluated. P ranges $1 \leq P \leq 30$ Therefore, next P lines contain the marks for each professor separated by ", ".

Each mark M is an integer ($0 \leq M \leq 100$)

Output:

The P_{th} professor with less consistency and its dispersion score with accuracy of 2 decimal points separated by tab.

Example:

Input:

```
1
2
2, 4, 8, 6, 10, 12
2, 4, 8, 6, 10, 2
```

Output

```
1    11,67
```

10. DISH

A restaurant in Kabul is very interested to create new food by combining multiple foods. They want to name each of these foods in a way so that customers can learn about it with the least explanation when displaying the menu.

The head of the restaurant decided to use the shortest string which includes the main meal names as substrings in the new name. For example, "shrimpce" is the name of a dish which was created by combining "rice" and "shrimp", and there is no shorter string that has the same property. Write a program that calculates the shortest name for those dishes' foods.

Input:

The first input line contains N, the number of test cases. The next N line, each contains two strings that represent the names of the foods that should be combined. All names have a maximum length of 100 and only consist of alphabetic characters.

Output:

For each test case, output the shortest name of the resulting food on one line. If more than one shortest name is possible, any one is acceptable.

Example:

Input:

```
3
spaghetti salad
chicken cheese
ananas banana
```

Output:

```
spaghettilad
chickenese
bananas
```

11. RUN

An evil gang has decided to free prisoners from their prison. The prison is designed as a spiral and has a number of solitary cells. Prisoners are given a certain time to find their way out of prison. They shall be released if they can find their way out within the given time. Otherwise, the prison doors will be closed again. The prison has N cells that are connected together in a spiral form. Each cell has paths with a number of other cells. The prison has E exit doors. While escaping, each cell can contain as many people as possible.

With the assumption that prisoners know every path, write a program that predicts the number of prisoners that can and can't escape from the prison.

Input:

The first three input lines contain

- N, the number of cells in the prison. Cells are numbered 1, 2, ..., N. (N <= 100)
- E, the number of the exit cell. (0 < E < 100)
- T, starting value for the count-down timer (in some arbitrary time unit). (0 < T < 1000)

The fourth line contains M the number of connections in the prison. Each next M lines, specify a connection (one-way connection) between cells with three integer numbers: two cell numbers A and B (in the range 1, ..., N) and the number of time units it takes to travel from A to B.

Notice that each connection is one-way, i.e., the prisoner can't travel from B to A unless there is another line specifying that passage. Also, the time required to travel in each direction might be different.

Output:

Output a single line with the number of prisoners that reached the exit cell.

Check the next page for an example.

Example:

Input:

```
4
2
1
8
1 2 1
1 3 1
2 1 1
2 4 1
3 1 1
3 4 1
4 2 1
4 3 1
```

Output:

```
3
```

12. KABISA

Many years ago, people were struggling with 6 hours extra that every year has. They decided to do calculate the 6 hours and keep every year as 365 days. The direct consequence of that calculation happened to the starting point of the new year. For example, they had a new year in winter, summer, fall, or spring. To fix the new years' time, they decided to add extra day after every 4 years and they called it a leap year and keep the other 3 years 365 days. Your job is to write a program to find what are leap years in the given years.

Input:

First line contains the number of test cases (T): $1 \le T \le 10$

Second line indicates the list of given years Y, separated by commas (","). $1 \le Y \le 2020$

Output:

The list of leap years separated by space.

Example:

Input:

```
1
2, 1, 8, 6, 10, 12
```

Output

```
8 12
```