

## OOM Assignment 3

1. An institute has examinations going on and therefore question papers need to be made. The institute has a poor history of students copying from each other and therefore every student is given a separate question paper made from a question bank. Every student should get exactly  $k$  questions. Every question can be given to a maximum of 1 student. So, no two students can have any question common among themselves. The question papers are made by a TA, on behalf of an instructor. The affinity of a question to a student is defined by the absolute difference between the question number ID (integer) and the numeric form of the roll number (of the form 1234567, where abc are characters and 1234567 can be any digit). In case of a tie a smaller question number (primary) and a smaller roll number (secondary) are preferred. Print the question paper for every student in the order that the students enter the room.

### Input format

The first number is the number of test cases. Every test case starts with  $q$  (the number of questions),  $n$  (the number of students) and  $k$  (the number of questions per student). Thereafter there are  $q$  lines of input, each line denoting question ID and question string (1 word). Thereafter there are  $n$  lines of input, denoting the student roll number and name (1 word). Thereafter, there are  $n$  lines, each line printing the student's roll number in the order that the students enter the room.

### Output Format

For every student, in the order of entry, print the student roll number followed by all questions (without IDs) on new lines.

### Sample Input

Number of test cases	1
Questions, students, k	7 2 3
Questions	3 Q3 6 Q6 1 Q1 5 Q5 2 Q2 4 Q4 7 Q7
Students	IIT2016008 IIT2016001
Entry order of students	IIT2016001 IIT2016008

### Sample Output

IIT2016001  
Q7  
Q6  
Q5  
IIT2016008  
Q4

Q3  
Q2

### Explanation

	Roll No.	Question No.	Affinity Cost
Assignment 1	IIT2016001	7	2015994
Assignment 2	IIT2016001	6	2015995
Assignment 3	IIT2016001	5	2015996
Assignment 4	IIT2016008	4	2016004
Assignment 5	IIT2016008	3	2016005
Assignment 6	IIT2016008	2	2016006

2. In question 1 consider that there are  $n$  TAs instead of just one. All TAs work under the instructor. Every TA has a different affinity function. There are typically 3 types of affinity functions:

- *closeness loving* (CL) TAs, who use the absolute of differences just like question 1;
- *best roll number* (BR), who attempt to go roll number-wise with the least roll number first
- *lucky* types (LU), who have a lucky number  $l$  and define affinity as (numeric part of roll number + question ID) mod  $l$

The instructor asks every TA to give a question-student pair and makes the assignment. The first assignment is based as per the 1<sup>st</sup> TA, the 2<sup>nd</sup> assignment as per the 2<sup>nd</sup> TA and so on in a round robin manner. Give the question papers hence formed.

### Input format

The first number is the number of test cases. Every test case starts with  $q$  (the number of questions),  $n$  (the number of students),  $t$  number of TAs and  $k$  (the number of questions per student). Thereafter there are  $q$  lines of input, each line denoting question ID and question string (1 word). Thereafter there are  $n$  lines of input, denoting the student roll number and name (1 word). Thereafter, there are  $t$  lines for TAs, with each TA associated with the name and type of affinity function. For lucky types,  $l$  is given as an additional input. Thereafter, there are  $n$  lines, each line printing the student's roll number in the order that the students enter the room.

### Output Format

For every student, in the order of entry, print the student roll number followed by all questions (without IDs) on new lines.

### Sample Input

Number of test cases	1
Questions, students, TAs, k	7 2 4 3
Questions	3 Q3 6 Q6 1 Q1 5 Q5 2 Q2 4 Q4 7 Q7

Students	IIT2016008 IIT2016001
TAs	TA1 BR TA2 CL TA3 LU 5 TA4 BR
Entry order of students	IIT2016001 IIT2016008

### Sample Output

IIT2016001  
 Q1  
 Q7  
 Q3  
 IIT2016008  
 Q2  
 Q4  
 Q6

### Explanation

	TA	Affinity Function	Roll No.	Question No.	Affinity Cost
Assignment 1	TA1	BR	IIT2016001	1	IIT2016001
Assignment 2	TA2	CL	IIT2016001	7	2015994
Assignment 3	TA3	LU	IIT2016008	2	$0 \text{ } ((2016008+2)\%5)$
Assignment 4	TA4	BR	IIT2016001	3	IIT2016001
Assignment 5	TA1	BR	IIT2016008	4	IIT2016008
Assignment 6	TA2	CL	IIT2016008	6	2016002

3. Assume in question 2, the instructor assigns students to TAs and then each TA allocates questions as per its own methodology. The instructor assigns the students to TAs in a round robin format. There are three types of TAs.

- Greedy (G): These TAs work by finding best pairing question and student and hence do the allotment.
- Student-wise (SW): These TAs go roll number wise for students and find the best question for the student.
- Question-wise (QW): These TAs go question wise and find the best student

Since no question can be repeated, the allocation is again done in a round robin fashion.

### Input Format

Same as above with added TA type

### Output Format

Same as above

**Sample Input**

Number of test cases	1
Questions, students, TAs, k	8 4 3 2
Questions	3 Q3 6 Q6 1 Q1 5 Q5 2 Q2 4 Q4 7 Q7 8 Q8
Students	IIT2016008 IIT2016001 IIT2016010 IIT2016003
TAs	TA1 QW BR TA2 SW CL TA3 G LU 5
Entry order of students	IIT2016001 IIT2016003 IIT2016008 IIT2016010

**Sample Output**

IIT2016001  
 Q8  
 Q7  
 IIT2016003  
 Q1  
 Q2  
 IIT2016008  
 Q3  
 Q4  
 IIT2016010  
 Q5  
 Q6

**Explanation****Student Assignments**

S. No.	Student	TA
1.	IIT2016008	TA1
2.	IIT2016001	TA2
3.	IIT2016010	TA3
4.	IIT2016003	TA1

	<b>TA</b>	<b>TA Type</b>	<b>Affinity Function</b>	<b>Roll No.</b>	<b>Question No.</b>	<b>Affinity Cost</b>
Assignment 1	TA1	QW	BR	IIT2016003	1	IIT2016003
Assignment 2	TA2	SW	CL	IIT2016001	8	2015993
Assignment 3	TA3	G	LU	IIT2016010	5	0
Assignment 4	TA1	QW	BR	IIT2016003	2	IIT2016003
Assignment 5	TA2	SW	CL	IIT2016001	7	2015994
Assignment 6	TA3	G	LU	IIT2016010	6	1
Assignment 7	TA1	QW	BR	IIT2016008	3	IIT2016008
Assignment 8	TA1	QW	BR	IIT2016008	4	IIT2016008