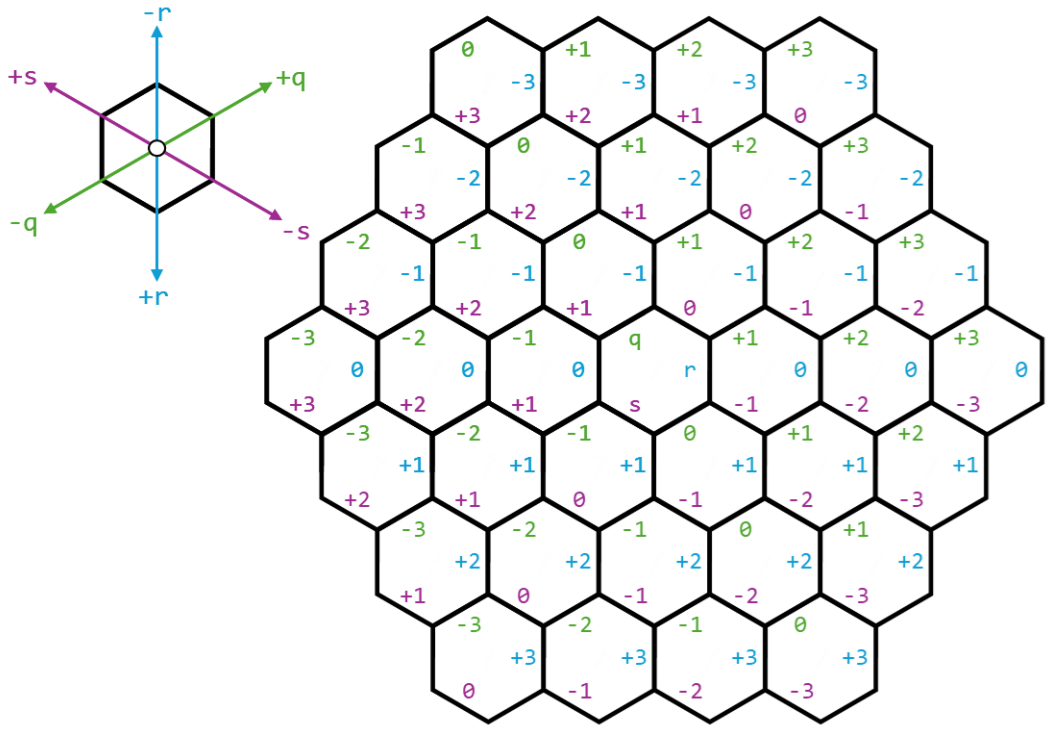
Problem H. Hexagrid

Input file:	`standard input`
Output file:	`standard output`
Time limit:	5 seconds
Memory limit:	1024 megabytes

A *hexagon* is a geometric polygon with six edges and six vertices. A *regular hexagon* is a hexagon with six equal sides and six equal angles. The regular hexagon is one of the simplest geometric shapes and often appears in nature as well as in architecture and art.

Today, Phat will study the *hexagrid*. This is a grid structure formed by hexagons arranged in rows and columns, creating a network. In this structure, the position of each cell can be determined by three coordinates (q, r, s) as shown in the following figure. It is known that in this coordinate representation, the invariant condition holds for all coordinates: $q + r + s = 0$.



Phat defines a *hexagrid* of level n as a hexagonal grid consisting of regular hexagonal cells with coordinates (q, r, s) satisfying $\max\{|q|, |r|, |s|\} \leq n$. Then, he writes a non-negative integer less than k on each regular hexagonal cell, where k is a **prime number**.

Phat can perform the following operation to transform the hexagrid of level n any number of times:

```
m c x
```

Where:

- `m` is any integer satisfying $|m| \leq n$.
- `c` is one of the three letters `q`, `r`, or `s`.
- `x` is any integer satisfying $0 \leq x < k$.

After performing this operation, all values in the regular hexagonal cells whose coordinate component c equals m will be increased by x units modulo k. In other words, $v \leftarrow (v + x) \bmod k$ where v is the current value of the hexagonal cell.

Please help Phat find a sequence of **the least number of operations** to set the value of all hexagonal cells to 0, or indicate that it is not possible to do so. If there are multiple sequences of transformations with the least number of operations that satisfy the condition, find any one of them.

Input

Each test consists of multiple test cases. The first line contains the number of test cases t ($1 \le t \le 100$). The description of each test case is as follows.

The first line contains two integers n, k ($1 \le n \le 100$, $2 \le k \le 10^6 + 3$, k is a **prime number**) — the level of the hexagrid and the parameter k.

Each of the next $2n + 1$ lines describes the cells of each row on the hexagrid of level n:

- The i-th line in the first $n + 1$ lines contains $i + n$ non-negative integers – the values of the cells in the row with coordinate $\texttt{r} = i - (n + 1)$;
- The j-th line in the next n lines contains $2n - j + 1$ non-negative integers – the values of the cells in the row with coordinate $\texttt{r} = j$.

The numbers in the same row are listed in increasing order of the coordinate `q`. It is guaranteed that the values in all hexagonal cells are less than k.

It is guaranteed that the sum of n across all test cases does not exceed 100.

Output

For each test case, output the answer in the following structure.

If it is not possible to set the value of all hexagonal cells to 0, output -1.

Otherwise, output an integer q ($0 \le q \le 10n$) which is the least number of operations needed to perform, followed by q lines, each of the form `m c x` as described above. If there is more than one optimal sequence of operations, you only need to output any one of them.

It can be proven that there always exists a sequence of no more than $10n$ operations, in case a transformation is possible.

Scoring

Subtask	Points	Constraints
1	1000	$k \le 5$ and the sum of n across all test cases does not exceed 15
2	1000	$k \le 5$
3	1000	The sum of k across all test cases does not exceed 500
4	1000	No additional constraints
Total	4000	

Example

standard input	standard output
3 1 3 0 0 0 2 0 1 1 1 2 1 1 0 1 0 1 0 2 7 6 6 5 4 2 5 3 1 6 0 2 1 5 6 6 2 4 4 5	3 -1 q 2 0 r 1 -1 s 2 -1 8 0 s 1 -2 r 1 1 q 5 2 r 2 -1 s 1 -1 r 3 1 s 2 0 r 6

Note

In the first test case, one of the optimal ways is:

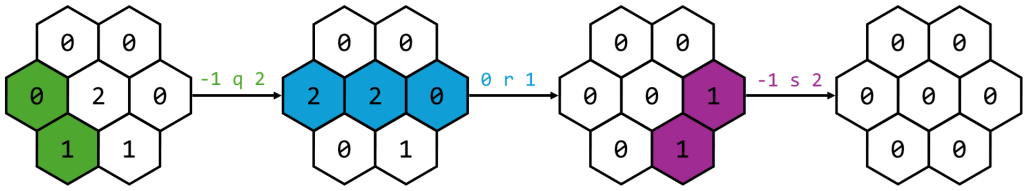


Illustration for the first test case

In the second test case, it can be proven that it is not possible to transform the grid to satisfy the condition that the values of all hexagonal cells equal 0.

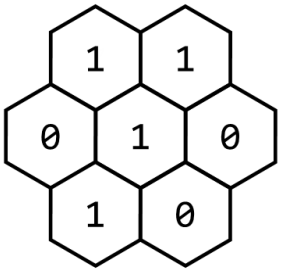


Illustration for the second test case

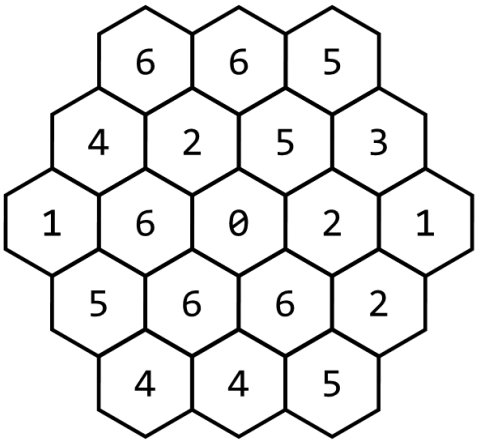


Illustration for the third test case