Superpiece

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

You are given an infinite chessboard. Each square of this chessboard is indexed by a pair of integers (r, c), denoting the row and the column, respectively. The only piece currently present on the chessboard is the **superpiece**. In each turn, the superpiece can move as one of the given chess pieces. The superpiece is standing at square (a_i, b_i). Calculate the minimum number of moves needed to reach the square (c_i, d_i).

The description of the subset of the chess rules applicable for this problem follows.

There are six types of pieces: rook, bishop, queen, king, pawn and knight. They move the following way:

- The queen (denoted by 'Q') can move to any square in the same row, column or diagonal as the square it is currently in. Formally, for any integer $k \neq 0$ a queen can move from (a, b) to $(a+k, b+k)$, $(a+k, b)$, $(a+k, b-k)$ and $(a, b+k)$.
- The rook (denoted by 'R') can move to any square in the same row or in the same column as the square it is currently in. Formally, for any integer $k \neq 0$ a rook can move from (a, b) to $(a+k, b)$ and$(a, b+k)$.
- The bishop (denoted by 'B') can move to any square in the same diagonal as the square it is currently in. Formally, for any integer $i \neq 0$ a bishop can move from (a, b) to $(a+k, b+k)$, and $(a-k, b+k)$.
- The knight (denoted by 'N') can move two squares in either direction and then simultaneously one square in an orthogonal direction. Formally, a knight can move from (a, b) to $(a+2, b+1)$, $(a+2, b-1)$, $(a+1, b+2)$, $(a+1, b-2)$, $(a-1, b+2)$, $(a-1, b-2)$, $(a-2, b+1)$ and $(a-2, b-1)$.
- The king (denoted by 'K') can move to any of the eight squares directly adjacent to the current square. Formally, a king can move from (a, b) to $(a+1, b+1)$, $(a+1, b)$, $(a+1, b-1)$, $(a, b-1)$, $(a, b+1)$, $(a-1, b-1)$, $(a-1, b)$ and $(a-1, b+1)$.
- The pawn (denoted by 'P') can move exactly one square forward. Formally, a pawn can move from (a, b) to $(a+1, b)$.

Note that since the superpiece is the only piece in the chessboard, the king can move anywhere without being worried about check, the pawn can never move diagonally as there are no enemy pieces to capture, and there is no castling move. Furthermore, the pawn can never move two squares forward, compared to regular chess where this is possible from the starting square.

Also, note that while the symbol denoting the chess piece is often the first letter of its name in English, it is the second letter for the "kNight" (to avoid confusion with the "King").

Input

The first line contains a single integer t $(1 \leq t \leq 1000)$ – the number of test cases.

The second line contains a non-empty substring of the string "QRBNKP" (in uppercase), specifying the set of chess pieces the superpiece can move as (in all test cases that follow).

t lines with test cases follow, the i-th of which is four space-separated integers a_i, b_i, c_i, d_i $(-10^8 \leq a_i, b_i, c_i, d_i \leq 10^8)$ – the original and the target position of the superpiece. It is guaranteed that $(a_i, b_i) \neq (c_i, d_i)$, i.e., the original position is different from the target.

Output

Output t lines, one for each test case.

The i-th of these lines is integer r_i – meaning that the superpiece needs a minimum of r_i moves to reach the target from its original position. If it is not possible to reach the target from the original position, output -1 instead.

Scoring

There are 9 test groups, described in the table below.

Group	Q	R	B	N	K	P	Points
1	Y	?	?	N	?	?	12
2	Y	?	?	Y	?	?	9
3	N	Y	?	?	?	?	13
4	N	N	Y	N	N	N	8
5	N	N	Y	?	?	?	6
6	N	N	N	Y	N	N	31
7	N	N	N	Y	?	?	8
8	N	N	N	N	Y	?	7
9	N	N	N	N	N	Y	6

The first column is the number of the test group. Then, 6 columns follow, one for each piece:

- Pieces denoted as Y are present in **all** test cases for the test group.
- Pieces denoted as N are present in **no** test cases for the test group.
- Pieces denoted as ? are present in some, but not all test cases for the test group.

The last column is the number of points for the test group.

Note that the test groups are not numbered in the expected order of their difficulty!

Examples

standard input	standard output
2 NKP 3 3 5 1 2 6 5 3	2 2
3 B 6 3 8 5 7 1 9 7 2 8 3 6	1 2 -1
6 N 0 0 1 2 0 0 -2 1 0 0 1 1 0 0 2 2 137 223 842 -412 22 16 230 17	1 1 2 4 448 105
4 Q 4 -3 8 -3 6 2 6 -13 7 7 4 10 12 54 -13 18	1 1 1 2
4 R 4 -3 8 -3 6 2 6 -13 7 7 4 10 12 54 -13 18	1 1 2 2
5 P 0 0 10 0 0 0 -10 0 0 0 0 10 0 0 0 -10 0 0 1 1	10 -1 -1 -1 -1

Note

Consider the first example test.

In the first test case, we are asked to go from $(3, 3)$ to $(5, 1)$, using the moves of knight, king and pawn. There are multiple ways of doing this in exactly 2 moves, for example:

- Move as a pawn to $(4, 3)$, then as a knight to $(5, 1)$.
- Move as a knight to $(5, 2)$, then as a king to $(5, 1)$.
- Move as a king to $(4, 2)$, and then again as a king to $(5, 1)$.

There is no way of achieving this by fewer than two moves – we would need a bishop or a queen to do that.

In the second test case, we are asked to go from $(2, 6)$ to $(5, 3)$. Again, the optimal solution is to use two moves. This time, both of these moves have to be knight moves, with the intermediate square being $(4, 5)$ or $(3, 4)$.