Problem E: Exhaustive Exploration

One of the most famous chess problems is that of finding a knight's tour, i.e. a route for a knight on an empty chess board where each square is visited exactly once. Such tours may also be considered for other kinds of chess pieces, and it is easy to find tours for queens or rooks, and to see that no tours exist for a bishop. Figure E.2 has an overview of the chess pieces and their moves.

Did you know that ... ?

... the number of knight's tours on an 8×8 chess board used to be unknown until quite recently? In 2014, it was computed to be $19\,591\,828\,170\,979\,904$.

It is also possible to find a tour for a pawn by making use of the *promotion rule*. From its starting square, the pawn first advances to the end of the board. Once it reaches the last row, it is replaced with a piece of the player's choice: a queen, rook, bishop or knight. The promoted piece then visits the remaining squares so that throughout this process each square is visited exactly once. Note that simply passing over a square does not count as visiting it.

Figure E.1: Illustration of the two sample cases.

In this problem, the chess board consists of a grid of $n \times n$ squares. The files (columns) are labelled with lowercase letters starting from `a`, the ranks (rows) are labelled with digits starting from `1`. Each square is denoted by the length 2 string consisting of its file and rank.

You are given a single white pawn on an otherwise empty chess board. Find a valid pawn's tour from the given starting square.

Input

The input consists of:

- One line with an integer n ($3 \le n \le 8$), the size of the chess board.
- One line with a square s, the starting square for the pawn's tour. It is guaranteed that s is a valid square on an $n \times n$ board and is neither on the first nor on the last rank.

Output

Output the piece you want to promote your pawn to (one of `queen`, `rook`, `bishop` or `knight`), followed by a sequence of n^2 squares describing a valid tour starting from s. Note that you can use both spaces and line breaks to separate your output, such as in Sample Output 1.

Sample Input 1	Sample Output 1
4 c2	queen c2 c3 c4 d4 b2 b3 a4 b4 a3 a2 a1 b1 d3 d1 c1 d2

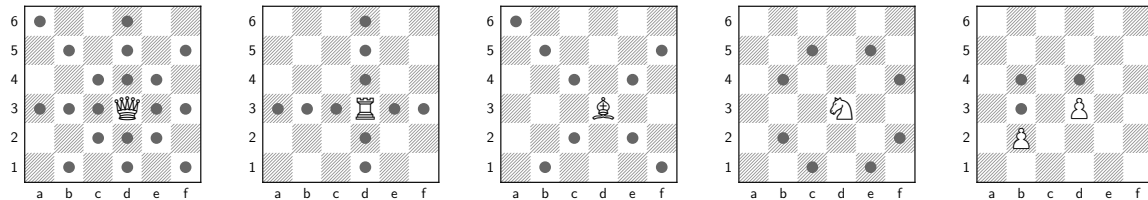| 3	knight
b2	b2 b3 a1 c2 a3 b1 c3 a2 c1

Figure E.2: From left to right: possible moves of queen, rook, bishop, knight and pawn.

- A *queen* can move by any number of squares, horizontally, vertically or diagonally.
- A *rook* can move by any number of squares, but only moves along ranks and files.
- A *bishop* can move by any number of squares, but only moves along diagonals.
- A *knight* can move to any square that is two squares away horizontally and one square vertically, or two squares vertically and one square horizontally.
- A *pawn* must always advance by one square to the next rank, with one exception: if it is on the second rank, it may advance by two squares instead of one.