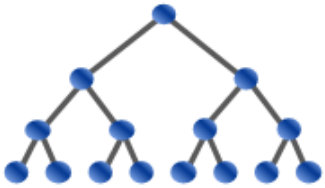

USACO 2022 US Open Contest, Platinum
Problem 2. Hoof and Brain

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Contest has ended.

Given a directed graph with N vertices and M edges ($2 \le N \le 10^5$, $1 \le M \le 2 \cdot 10^5$), Farmer John's cows like to play the following game with two players.

Place two tokens on distinct nodes in the graph. Each turn, one player, the brain, will choose a token that must be moved along an outgoing edge. The other player, the hoof, will choose which edge to move the token along. The two tokens can never be on the same node. If at some point the hoof can't make a valid move, the brain wins. If the game continues indefinitely, the hoof wins.

You are given Q queries ($1 \le Q \le 10^5$) indicating the starting nodes of the two tokens. For each query, output which player will win.

INPUT FORMAT (input arrives from the terminal / stdin):

The first line contains N and M.

The next M lines each contain two integers a and b, denoting an edge from a to b.

The graph does not contain self-loops or multiple edges.

The next line contains Q.

The final Q lines each contain two integers x and y satisfying $1 \le x, y \le N$ and $x \ne y$, indicating the starting nodes of the tokens.

OUTPUT FORMAT (print output to the terminal / stdout):

A string of length Q, where each character is B for the brain winning and H for the hoof winning.

****Note: the time limit for this problem is 4s, twice the default.****

SAMPLE INPUT:

```
9 10
1 2
2 3
3 4
4 7
3 5
1 6
6 8
8 9
9 6
7 2
4
1 5
1 2
1 6
2 4
```

SAMPLE OUTPUT:

```
BHHB
```

The brain can win the first game by selecting node 5; then the hoof has no valid move.

The brain can win the last game by selecting node 4 and then node 7; then the hoof has no valid move.

The hoof wins the other games.

SCORING:

- Test cases 2-3 satisfy $N \leq 100$, $M \leq 200$.
- Test cases 4-9 satisfy $N \leq 5000$.
- Test cases 10-21 satisfy no additional constraints.

Problem credits: Danny Mittal

Contest has ended. No further submissions allowed.