

## [CS 11] Prac 8i – Knight Threats

## Problem Statement

Consider an  $r \times c$  chessboard with some chess pieces in it. For simplicity, we ignore the actual rules of chess. For example, chess pieces don't have "color".

We say a square on the chessboard is **unsafe** if a piece can reach it in one move.

In one move, a knight can travel to any square that's an "L"-step away—that is, move two steps in one direction and then one step in the perpendicular direction. It can travel to that square even if there are pieces in between.

Given the locations of knights, label which squares are unsafe.

## Task Details

Your task is to implement a function called `knight_threats`. This function has a single parameter: a `tuple` of `r` `str`s, each of which is `c` characters long and represents a row. Each character represents a square and is:

- a  if it is free;
- a  if it contains a knight.

The function must return a `list` of `str`s representing the same chessboard, but with the unsafe squares labelled with `*`.

## Restrictions

(See 8a for more restrictions)

For this problem:

- Loops and lists are allowed.
- Up to 18 function definitions are allowed.
- Recursion is **disallowed**. (The recursion limit has been greatly reduced.)
- Sets and dictionaries are allowed.
- Generators and comprehensions are allowed.
- The source code limit is 6000.

## Example Calls

### Example 1 Function Call

```
knight_threats((
  | .....|,
  | .....|,
  | .# .....|,
  | .....# .....|,
  | .....# .....|,
  | .....# .....|,
  | .....# .....|,
  | .....|,
  ))
```

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### Example 1 Return Value

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### Example 1 Explanation

**Hint:** You can print a grid of `str`s by doing:

```
for row in grid:
    print(row)
```

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or by doing

```
print(*grid, sep='\n')
```

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## Constraints

- The function `knight_threats` will be called at most 1,000 times.
- The sum of the `rc` across all calls will be at most 500,000.
- $1 \leq r \leq 100$
- $1 \leq c \leq 5,000$

## Scoring

- You get 100 ❤️ points if you solve all test cases where:
  - $r, c \leq 50$
  - the sum of the  $rc$  across all calls will be at most 10,000.
- You get 30 ❤️ points if you solve all test cases where:
  - there are at most 5000 pieces.
- You get 20 ❤️ points if you solve all test cases where:

## ❓ Clarifications

No clarifications have been made at this time.

## Discussion