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Tiling Problem

Given a "2 x n" board and tiles of size "2 x 1", count the number of ways to tile the given board using the 2 x 1 tiles. A tile can either be placed horizontally i.e., as a 1 x 2 tile or vertically i.e., as 2 x 1 tile.

Examples:

```
Input n = 3
Output: 3
Explanation:
We need 3 tiles to tile the board of size  2 x 3.
We can tile the board using following ways
1) Place all 3 tiles vertically.
2) Place first tile vertically and remaining 2 tiles horizontally.
3) Place first 2 tiles horizontally and remaining tiles vertically

Input n = 4
Output: 5
Explanation:
For 2 x 4 board, there are 5 ways
1) All 4 vertical
2) All 4 horizontal
3) First 2 vertical, remaining 2 horizontal
4) First 2 horizontal, remaining 2 vertical
5) Corner 2 vertical, middle 2 horizontal
```

Board

Tile

We strongly recommend that you click here and practice it, before moving on to the solution.

Let "count(n)" be the count of ways to place tiles on a "2 x n" grid, we have following two ways to place first tile.
1) If we place first tile vertically, the problem reduces to "count(n-1)"
2) If we place first tile horizontally, we have to place second tile also horizontally. So the problem reduces to "count(n-2)"

Therefore, count(n) can be written as below.

```
count(n) = n if n = 1 or n = 2
count(n) = count(n-1) + count(n-2)
```

The above recurrence is noting but Fibonacci Number expression. We can find n'th Fibonacci number in O(Log n) time, see below for all method to find n'th Fibonacci Number.

Different methods for n'th Fibonacci Number.

This article is contributed by Saurabh Jain. Please write comments if you find anything incorrect, or you want to share more information about the topic discussed above

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   they will differ
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sourcedelica · a year ago
The base cases should be
count(0) = 1
count(-1) = 0

For example:
def count(n: Int): Int =
if (n < 0) 0
else if (n == 0) 1
else count(n - 1) + count(n - 2)

The explanation is:
Every time you fill up the board you have zero spaces to put a tile.
Count 1 every time you fill up the board.

If you place a tile vertically there are n-1 more tiles that can be placed.
If you place a tile horizontally you need to place another tile horizontally and then there will be n-2 more tiles that can be placed.

Also, like Fibonacci, it has repeating subproblems so you should memoize it.
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the answer should be:
count(n) = n if n = 1 or n = 2
count(n) = count(n-1) + count(n-2)
3 ∧ ∨ · Reply · Share ›

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   Thanks for pointing this out. We have updated the recursive formula.
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for the first example i think 3 tiles horizontally is possible?
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count(2)=2 and not equal to count(0)+count(1).
1 ∧ ∨ · Reply · Share ›

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Isn't the board should be 2XN instead of NX2.
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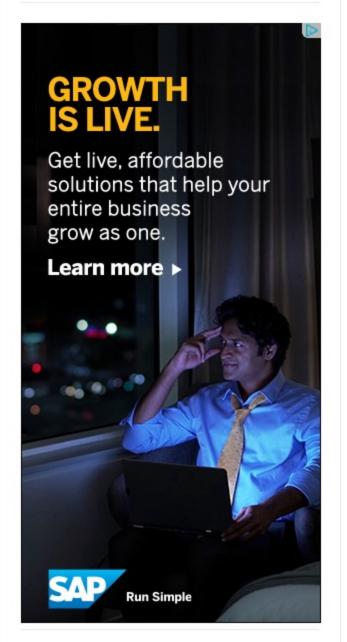   ∧ ∨ · Reply · Share ›

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