Writing an Algorithm for Tiling a Floor

Your task is to tile a rectangular bathroom floor with alternating black and white tiles measuring 4×4 inches. The floor dimensions, measured in inches, are multiples of 4.

Step 1   Determine the inputs and outputs.

The inputs are the floor dimensions (length $\times$ width), measured in inches. The output is a tiled floor.

Step 2   Break down the problem into smaller tasks.

A natural subtask is to lay one row of tiles. If you can solve that task, then you can solve the problem by laying one row next to the other, starting from a wall, until you reach the opposite wall.

How do you lay a row? Start with a tile at one wall. If it is white, put a black one next to it. If it is black, put a white one next to it. Keep going until you reach the opposite wall. The row will contain **width / 4** tiles.

Step 3   Describe each subtask in pseudocode.

In the pseudocode, you want to be more precise about exactly where the tiles are placed.

> Place a black tile in the northwest corner.
> While the floor is not yet filled, repeat the following steps:
>   Repeat this step width / 4 − 1 times:
>   Place a tile east of the previously placed tile. If the previously placed tile was white, pick a black one; otherwise, a white one.
>   Locate the tile at the beginning of the row that you just placed. If there is space to the south, place a tile of the opposite color below it.

Step 4   Test your pseudocode by working a problem.

Suppose you want to tile an area measuring 20×12 inches.
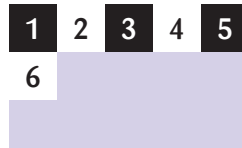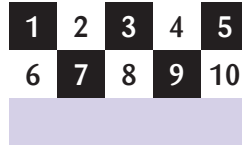The first step is to place a black tile in the northwest corner.
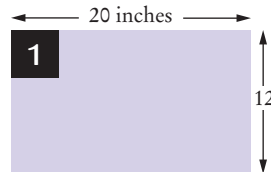
Next, alternate four tiles until reaching the east wall. (**width / 4 − 1 = 20 / 4 − 1 = 4**)

There is room to the south. Locate the tile at the beginning of the completed row. It is black. Place a white tile south of it.

1	2	3	4	5
6				

Complete the row.

1	2	3	4	5
6	7	8	9	10

There is still room to the south. Locate the tile at the beginning of the completed row. It is white. Place a black tile south of it.

1	2	3	4	5
6	7	8	9	10
11				

Complete the row.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15

Now the entire floor is filled, and you are done.