TILINGS at Berkeley Math Circle! (Part 2)

Inspired by Activities of Julia Robinson Math Festival and Nina Cerutti and Leo B. of SFMC.

SPECIAL Tiles - 2^i x 2^i Squares….

Suppose you have an unlimited amount of Special Tiles that are formed with the following dimensions: The length of the sides of each of the Tiles is of the form 2^i, where i is a nonnegative integer. *For example, when i = 2 we have a tile of size $2^2 x 2^2$ = 4x4.*

Using what you know about 2^i = 2 multiplied by itself i times, figure out the dimensions of other Tiles (add pictures if that's helpful for you):

i	2^i	Tile Size (Square of 2^i x 2^i)	Picture of Tile
i = 0	2^0 =		
i = 1			
i = 2			
i = 3			
i = 4			
i = 5			
i = 6			

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When we tile something in 1-D using our special Tiles, we don't care about their height, we only care about using their width of 2^i to tile the length 2^i of the total line segment length.

1. Draw a line of length 23.
   a. What is the greatest amount of Tiles of size 2^i x 2^i can you use to "tile" this line?
   b. What is the least amount of squares you can use to tile this line?

2. Suppose that you are only allowed to use **ONE** (and only one) of each Tile size.

Which of the following line segments can you tile under the given restrictions? If you find a way to tile the line, indicate the pattern by filling in the number 1 on the tiles that you used to tile that line segment length.

	2^4x2^4 Tile	2^3 x 2^3 Tile	2^2x2^2 Tile	2^1x2^1 Tile	2^0x2^0 Tile
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					

a. Is this pattern familiar? Add 0's where you don't use those Tiles.
b. If you want to tile a line segment of length m, how many square Tiles will you need?