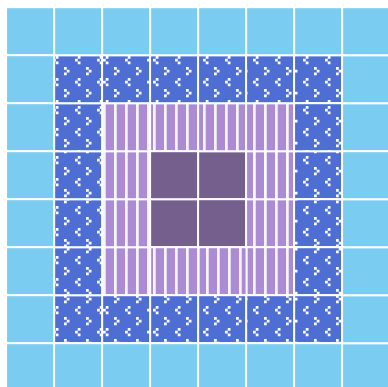


## My new quilt of squares

I'm making a quilt from 2" x 2" squares of fabric. Help me figure out how many squares I'll need of each fabric to make my whole quilt.



	Fabric	Number of blocks needed	1 <sup>st</sup> difference	Number of blocks in the whole quilt at this point
1st		4	} 8	4
2nd		12		
3rd		20		
4th		28		
5th	5 <sup>th</sup> fabric			
***		***		***
10th	10 <sup>th</sup> fabric			
***	***	***		***
Nth	N <sup>th</sup> fabric			

*Analysis of constant difference found on first subtraction:* Every time that the "fabric layer" number goes up by one the "number of blocks needed" goes up by 8. That implies that the number of blocks needed for the next surround is going up 8 times as fast as the fabric number is going up. "8 times" is the important clue here so I'm going to add a column called 8 times N.

Compare my "8 x N" column to my "Number of blocks needed" column. Do you see any pattern? Try out your theories. Do any of your theories work every time? If so, then that is your formula.

Fabric	Number of blocks needed	1 <sup>st</sup> difference	8 x N	
1 <sup>st</sup> fabric	4	} 8	8	
2 <sup>nd</sup> fabric	12			16
3 <sup>rd</sup> fabric	20			24
4 <sup>th</sup> fabric	28			32
5 <sup>th</sup> fabric	36			40
N <sup>th</sup> fabric			8N	

Now I'm going to compare my "fabric number" to my "number of blocks in the whole quilt" column and try to devise a formula for that pattern.

Fabric layer = N	Number of blocks in the whole quilt at	1 <sup>st</sup> differences	2 <sup>nd</sup> differences	
1 <sup>st</sup> fabric	4	} 12 } 20 } 28 } 36	} 8 } 8 } 8	
2 <sup>nd</sup> fabric	16			
3 <sup>rd</sup> fabric	36			
4 <sup>th</sup> fabric	64			
5 <sup>th</sup> fabric	100			
N <sup>th</sup> fabric				

When it takes two subtractions to finally find a constant difference, we know that this will become a 2<sup>nd</sup> degree equation with an  $N^2$  term.

It's interesting to note that if we must find 3 differences to find a constant difference then the  $n^{\text{th}}$  term of this sequence will result in a 3<sup>rd</sup> degree equation. 4 differences will result in a 4<sup>th</sup> degree equation. And so forth.

To further deduce my formula for the  $n^{\text{th}}$  term of this sequence, I'll create a 5th column for our chart above and list the values of  $N^2$ .

How does that 5th column compare to the column with the total number of blocks in the quilt. Try to find an operation that consistently makes changes to the  $N^2$  column equal to the "total blocks in the quilt" column.