

1. This pattern is an increasing number of X shapes, each made by four toothpicks. Can you explain the formula that describes how many toothpicks it takes to make a row of X shapes?

Placement in Pattern	Picture of Pattern	Number-Value of Pattern
1		4
2		8
3		12
4		16
n		y = ?

+4

+4

+4

$$y = 4 \cdot n$$

boxes?

Placement in Pattern	Picture of Pattern	Number-Value of Pattern
1		3 4
2		6 7
3		9 10
4		12 13
n		y = ?

+3  
+3  
+3  
 $y = 3 \cdot n + 1$




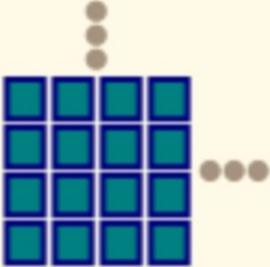
Placement in Pattern	Picture of Pattern	Number-Value of Pattern
1		6
2		11
3		16
n		y = ?

+1

+5  
+5

$$y = 5 \cdot n + 1$$


How does the number of tiles in a square increase? Do we know this formula's name?

Placement in Pattern	Picture of Pattern	Number-Value of Pattern
1		$1 \cdot 1 = 1$
2		$2 \cdot 2 = 4$
3		$3 \cdot 3 = 9$
$n$		$y = ?$

No more repeated addition

+3


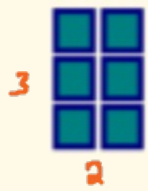
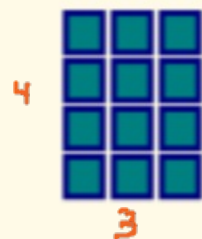
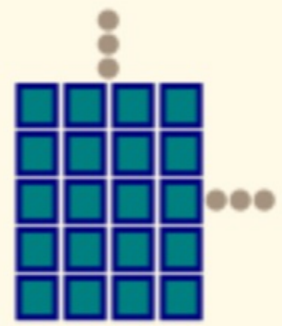
+5



$$y = n \cdot n$$

$$y = n^2$$

these rectangular areas:

Placement in Pattern	Picture of Pattern	Number-Value of Pattern
1		2
2		6
3		12
$n$		$y = ?$

$y = n \cdot (n + 1)$   
 or  
 $y = n^2 + n$