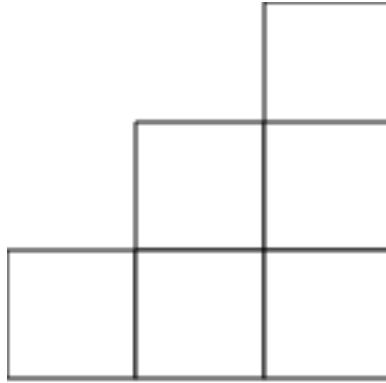


## Growing Staircases

### Level A



This is a staircase built of blocks. The staircase has three steps.

How many blocks are needed for just the top step?

How many blocks are needed for the middle step?

How many blocks are needed for the bottom step?

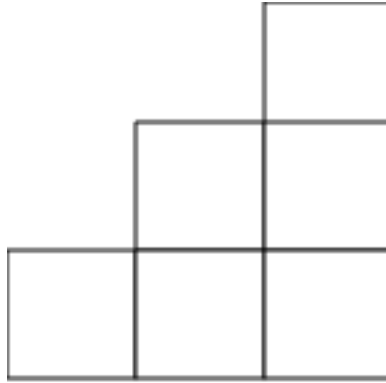
How many blocks in all are needed to make this staircase of three steps?

Explain how you know.



## Growing Staircases

### Level B



This is a staircase that has three steps. Draw the blocks in the diagram to make the fourth step.

How many blocks in all are needed to make a staircase with five steps?

How many blocks does it take to build just the twelfth step in a staircase with twelve steps?

How many blocks in all are needed to make a staircase of ten steps?

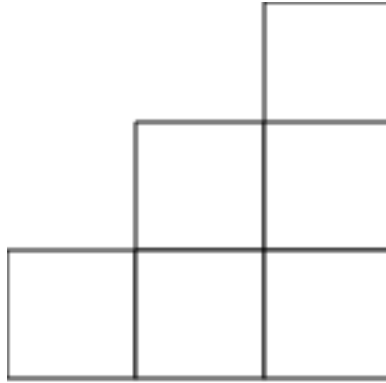
A staircase has 105 blocks. How many steps does it have?

Explain your answers.



## Growing Staircases

### Level C



This is a staircase that has three steps. Think about a staircase that follows the same pattern, but has one hundred steps. How many blocks are needed to make just the one-hundredth step? Explain how you know.

Write a rule to find the number of blocks needed for the  $n$ th step in a staircase that has  $n$  steps. Explain your rule.

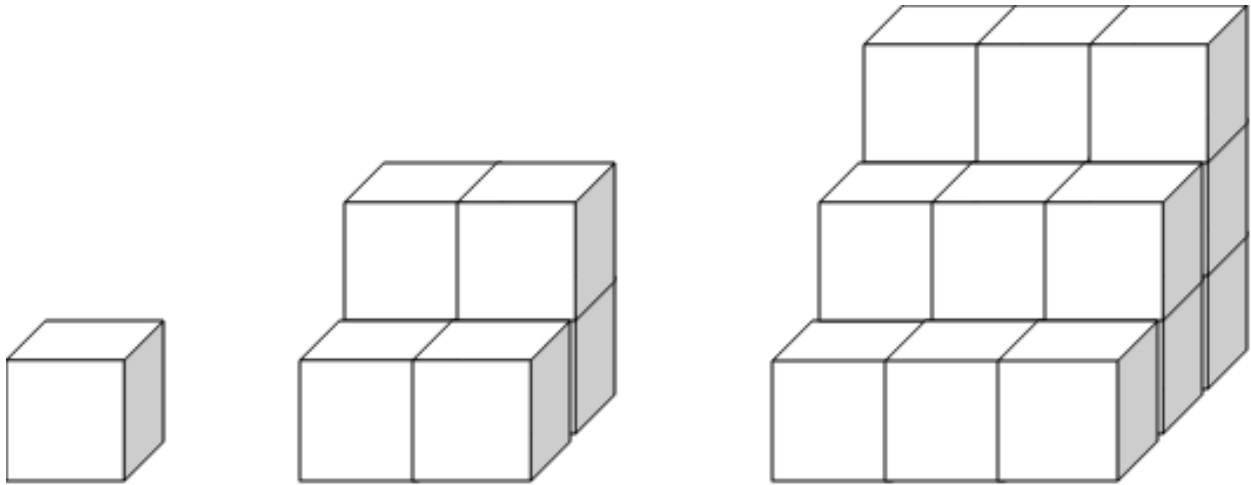
Write a rule to find the total number of blocks needed to make a staircase that has  $n$  steps. Explain your rule.

Write a rule that, given any number of blocks,  $y$ , you can use to determine how many steps are in the staircase. Explain your rule.



## Growing Staircases

### Level D



Consider this set of staircases constructed of blocks. The first staircase has one step, the second staircase has two steps, and the third staircase has three steps.

How many blocks in all are needed to make a staircase with five steps, assuming it follows the same pattern?

How many blocks make up the top step of a staircase with  $n$  steps?

How many blocks make up the first level (the base) of a staircase with  $n$  steps?

Given a staircase with 30 steps, explain a process you might follow to determine the number of blocks necessary to build the staircase.

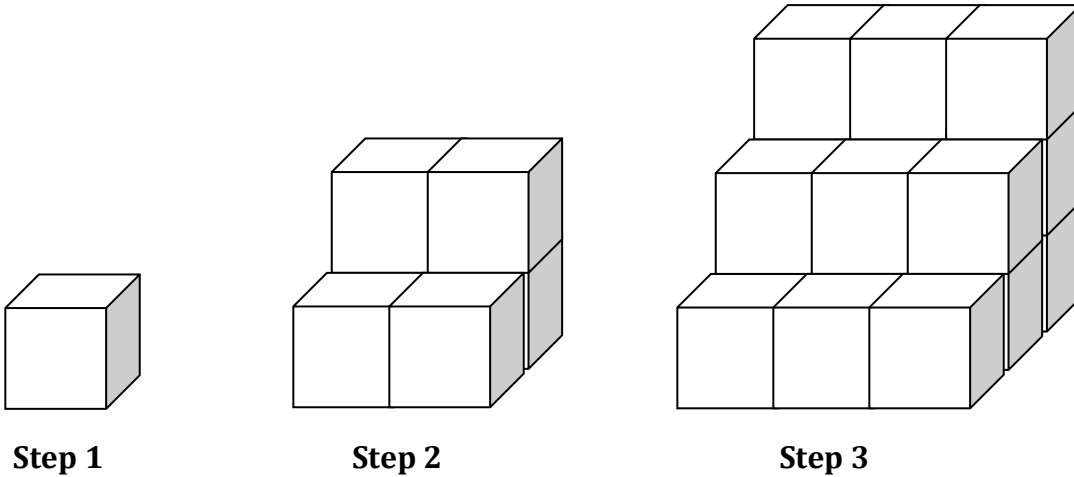
Explain your answers.





## Growing Staircases

### Level E



Consider this set of staircases. The first staircase has one step, the second staircase has two steps, and the third staircase has three steps. Assuming the pattern continues, find a general (closed) formula to find the number of blocks needed to build a staircase with  $n$  steps.

Justify why your formula works.

Explain and justify which stages will require an odd number of blocks to build.

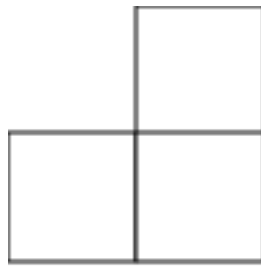


## Growing Staircases

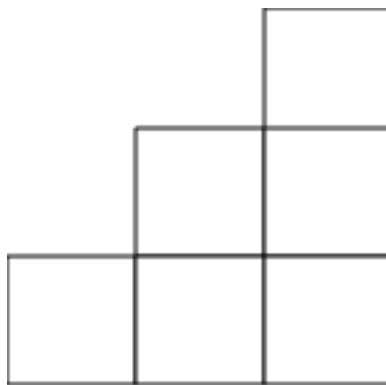
### Manipulatives



First Staircase



Second Staircase



Third Staircase

