

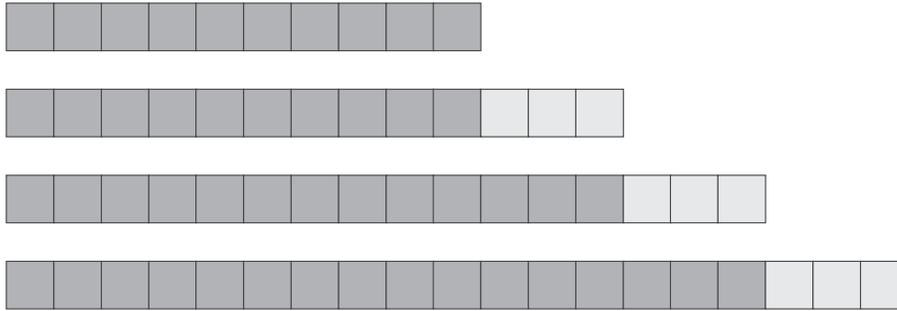
## 4 Using Pattern Rules

### Using a Rule to Determine a Term's Value

When you know a pattern rule, you can use it to determine the value of any term in the pattern.

For example, if a pattern rule is "Start with 10 and add 3 each time," you can figure out the 10th term in the pattern in two ways:

1. You can list the first 10 terms: 10, 13, 16, 19, 22, 25, 28, 31, 34, 37.
2. Since you add 3 nine times, you can add  $9 \times 3$  to 10 and get 37.



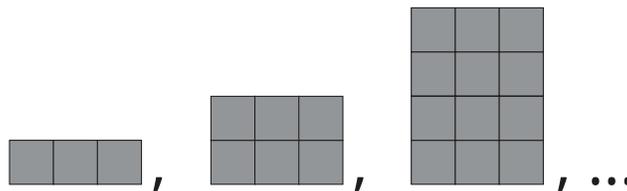
If a pattern rule is "Multiply the term's position by 8 and then subtract 3," you can figure out the 10th term by calculating:

$$10 \times 8 - 3 = 77$$

### Using a Rule to Determine a Term's Position

If you know a pattern rule and know a term's value, you can figure out where in the pattern that term appears.

For example, if a pattern rule is "Start at 3 and keep multiplying by 2," you can figure out the position of the term whose value is 1536.



### Using a Rule to Determine a Term's Position (continued)

- You can list the terms in the pattern:

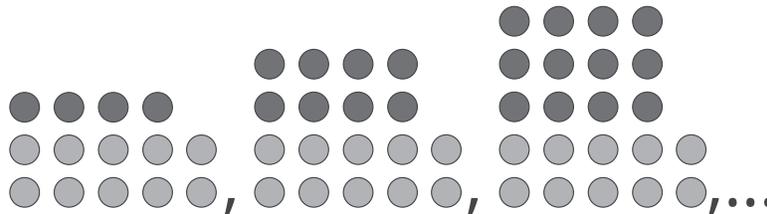
3, 6, 12, 24, 48, 96, 192, 384, 768, 1536, ...  
 1536 is the 10th term.

- You can start at 1536 and divide by 2 repeatedly until you get to 3:

$1536 \div 2 = 768$ ,  $768 \div 2 = 384$ ,  $384 \div 2 = 192$ ,  $192 \div 2 = 96$ ,  $96 \div 2 = 48$ ,  
 $48 \div 2 = 24$ ,  $24 \div 2 = 12$ ,  $12 \div 2 = 6$ ,  $6 \div 2 = 3$

Then you can think: Since I divided 1536 by 2 nine times to get to 3, I would have to start at 3 and multiply by 2 nine times to get to 1536.  
 That means 1536 is the 10th term.

If a pattern rule relates a term's value to its position, you can calculate to figure out the position of a term. For example, the rule for the following pattern is "Multiply the position by 4 and add 10."



To figure out which term has a value of 58, you can write  $4 \times \square + 10 = 58$ .  
 Since  $4 \times 12 + 10 = 58$ ,  $\square = 12$ , and 58 is the 12th term.

### Definitions

**pattern rule:** a description that tells how a pattern starts and how it continues; for example, a pattern rule for 2, 4, 8, 16, ... is "Start at 2 and multiply by 2 each time"

**term:** each element in a pattern