

11.1 Mathematical Patterns

A sequence is an ordered list of numbers. Each number in a sequence is a term.

Sometimes you can find the next term in a sequence by using a pattern from the terms that come before it.

Describe the pattern formed. Find the next three terms.

27, 34, 41, 48, ... *add 7*
... 55, 62, 69, ...

243, 81, 27, 9, ... *multiply by $\frac{1}{3}$*
... 3, 1, $\frac{1}{3}$, ...

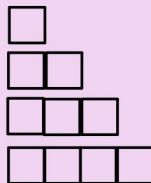
3. Start with a square with sides 1 unit long. On the right side, add on a square of the same size. Continue adding one square at a time in this way.

A) Draw the first four figures of the pattern.

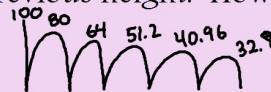
B) Write the number of 1-unit segments in each figure above as a sequence. 4, 7, 10, 13, ...

C) Predict the next term of the sequence. Explain.

16 add 3 (top, right, bottom)



Suppose you drop a ball from a height of 100 cm. It bounces back to 80% of its previous height. How high will it go after its fifth bounce?



A Recursive Formula - defines the terms in a sequence by relating each term to the ones before it.

The pattern from example 4 above describes the ball's height as $a_1 = 100$
 $a_n = .8a_{n-1}$

An Explicit Formula - is a formula that expresses the n th term in terms of n .

You are able to find the value of a term of a sequence without knowing the preceding term. Instead you can use the number of the term to calculate its value.

Describe the pattern that allows you to find the next term in the sequence 2, 6, 18, 54, 162, ... multiply by 3

- A) Write the recursive formula $a_1 = 2$ $a_n = 3(a_{n-1})$
- B) Find the sixth and seventh terms in the sequence. 4 86, 1458
- C) Find the value of a_{10} in the sequence. 39,366

	a_1	a_2	a_3	a_4
Side length	1	2	3	4
Perimeter	5	10	15	20

The spreadsheet shows the perimeters of regular pentagons with sides from 1 to 4 units long. The numbers in each row form a sequence.

- A) For each sequence, find the next term (a_5) and the twentieth (a_{20})

	5 ... 20
Side	5 ... 20
perim.	25 ... 100

- B) Write an explicit formula for each sequence.

Side $a_n = n$
 perimeter $a_n = 5n$