

Sec. 7.3 - 7.4 - Recursion Formulas

Learning Goal: By the end of today, I will be able to generate terms using a recursive formula.

- With an explicit formula, you can calculate the n th term of a sequence without knowing any previous terms (arithmetic, geometric)
 - With a recursion formula, you can calculate the n th term of a sequence only when you know one or more previous terms.
 - A recursion formula has two parts:
 - the value(s) of the first term(s)
- and
- a (recursion) equation that shows how to calculate each term from the term(s) before it.

Dec 12-11:58 AM

Arithmetic sequence

general term $t_n = a + (n-1)d$

recursive $t_n = t_{n-1} + d$

discrete linear $y = d(x-1) + a$

Dec 12-12:11 PM

Geometric

General term $t_n = ar^{n-1}$

Recursive $t_n = r \times t_{n-1}$

Discrete exponential $y=ar^{x-1}$

Dec 12-12:12 PM

What if the function isn't obvious?

1, 8, 16, 26, 39, 56, 78, ...

Find the next three terms

(hint, finite differences)

Dec 12-12:12 PM

A reading example...

p436 - 7 Ex 3

Determine the recursive formula:

5, 14, 41, 122, 365, 1094, 3281,...

Here it's a combination of geometric and arithmetic

$$t_1 = 5 \quad t_n = 3t_{n-1}$$

Dec 12-12:13 PM

Sec 7.4 Examples of recursive formulas

Fibonacci Sequence Rabbit question...

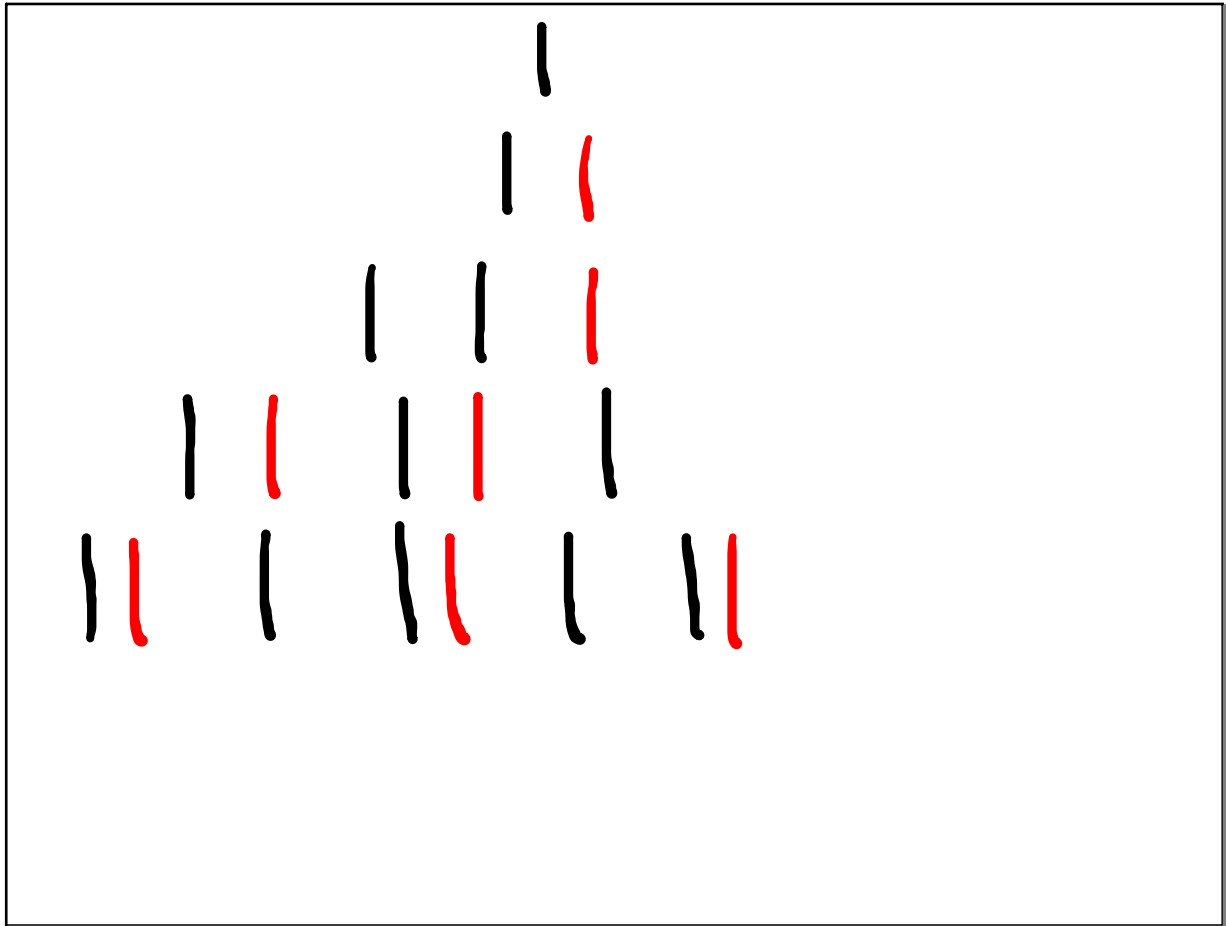
-1 pair of rabbits, produce another pair of rabbits after a month.

-The next month, the original pair produces another pair, but the second pair are too young to reproduce.

-The third month their are now two pairs about to reproduce, and one pair not reproducing.

-The fourth month there are now 3 pairs reproducing and two pairs not reproducing.

May 15-12:34 PM



Dec 17-9:57 PM

1,1,2,3,5,8,....

This is the Fibonacci Sequence

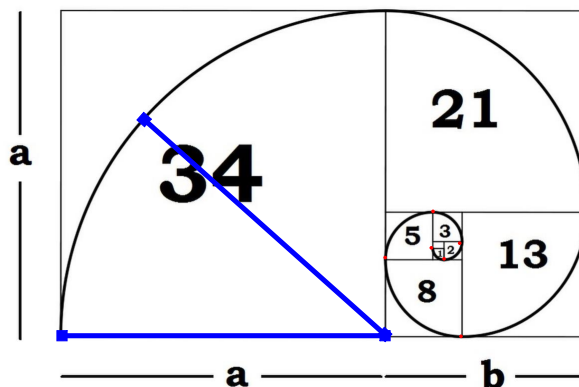
$$t_1 = 1, t_2 = 1, t_n = t_{n-1} + t_{n-2}$$

<https://www.quora.com/What-are-the-real-life-applications-of-Fibonacci-series>

Flower petals: The number of petals on some flowers follows the Fibonacci sequence. It is believed that in the Darwinian processes, each petal is placed to allow for the best possible exposure to sunlight and other factors.

Pinecones: The spiral pattern of the seed pods spiral upward in opposite directions. The number of steps the spirals take tend to match Fibonacci numbers.

Fibonacci Spiral and golden Ratio - see p444



May 15-12:39 PM

Read Ex 4 p437

page 443 #3

p447

#1ad, 2ace, 4ad, 6, 7

May 15-12:40 PM