Recursion
Discussion 6

1.

FACTORIAL

woohoo!

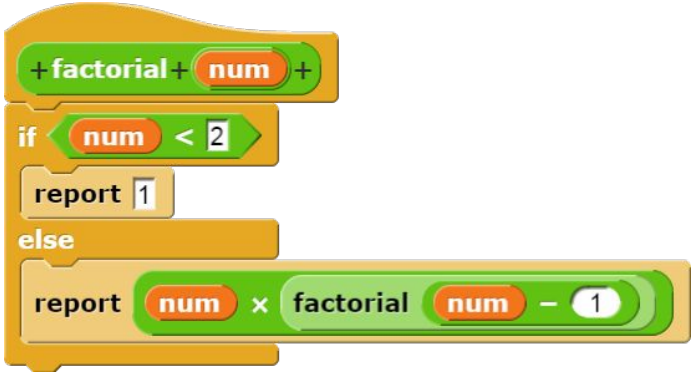
First an example: Factorial

- “The factorial of a non-negative number n, denoted by n! is the product of all positive integers less than or equal to n.”
  - “for example, 5! = 5 x 4 x 3 x 2 x 1 = 120”

- We can also write this as:

5! = 5 x 4! = 5 x 4 x 3! = 5 x 4 x 3 x 2! = 5 x 4 x 3 x 2 x 1! = 5 x 4 x 3 x 2 x 1 = 120

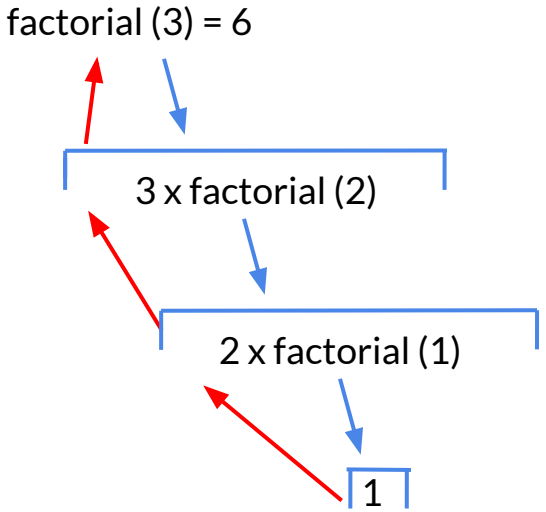
Factorial in Snap*!*



- Use factorial (5) as an example.
- In the previous slide, 5! could be represented as 5 x 4! = 5 x 4 x 3! and etc.
- The same logic applies for this Snap*!* version.
- factorial(5) = 5 x factorial(4) = 5 x 4 x factorial(3), and etc.
- The recursion finally ends at factorial(1), when our block just reports 1, not calling itself again.

Factorial in Snap*!*

Think of this recursive process like a ladder. You go down the ladder until you hit the base case, then you go back up to evaluate and compute the values.



2.

Defining Recursion

woohoo!

What does recursion mean to you?

Based on what you've learned in lab, lecture, and your personal thoughts and/or analogies, how would you define recursion?

Recursion

Base Case(s):

Recursive Case(s):

Recursion

Base Case(s):

- Simplest form of the problem.

Recursive Case(s):

Recursion

Base Case(s):

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Recursive Case(s):

- Divide problem into smaller instances.

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- Divide problem into smaller instances.
- Invoke function (recursively).

Recursion

Base Case(s):

- Simplest form of the problem.

Recursive Case(s):

- Divide problem into smaller instances.
- Invoke function (recursively).
- Work towards base case.

3.
Fibonacci

woohoo!

The Fibonacci Sequence

So what is the Fibonacci sequence?

The Fibonacci Sequence

So what is the Fibonacci sequence?

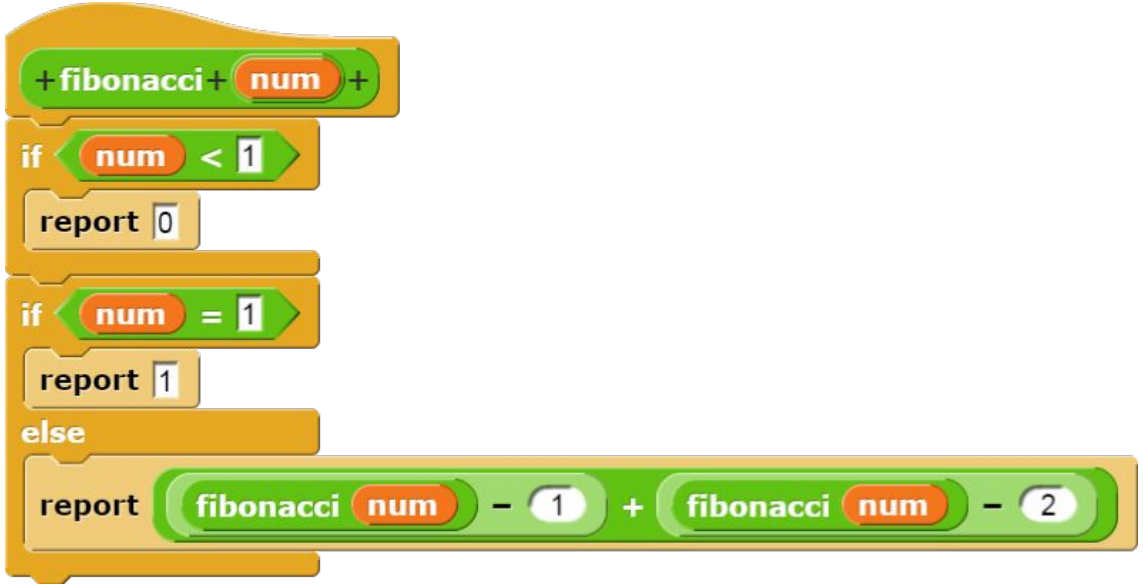
- It is the numbers: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144…
- “In mathematical terms, the sequence F_n of Fibonacci numbers is defined by the recurrence relation --

  $F_n = F_{n-1} + F_{n-2}$ with seed values $F_0 = 0$, $F_1 = 1$”

The Fibonacci Sequence

"$F_n = F_{n-1} + F_{n-2}$ with seed values $F_0 = 0$, $F_1 = 1$"

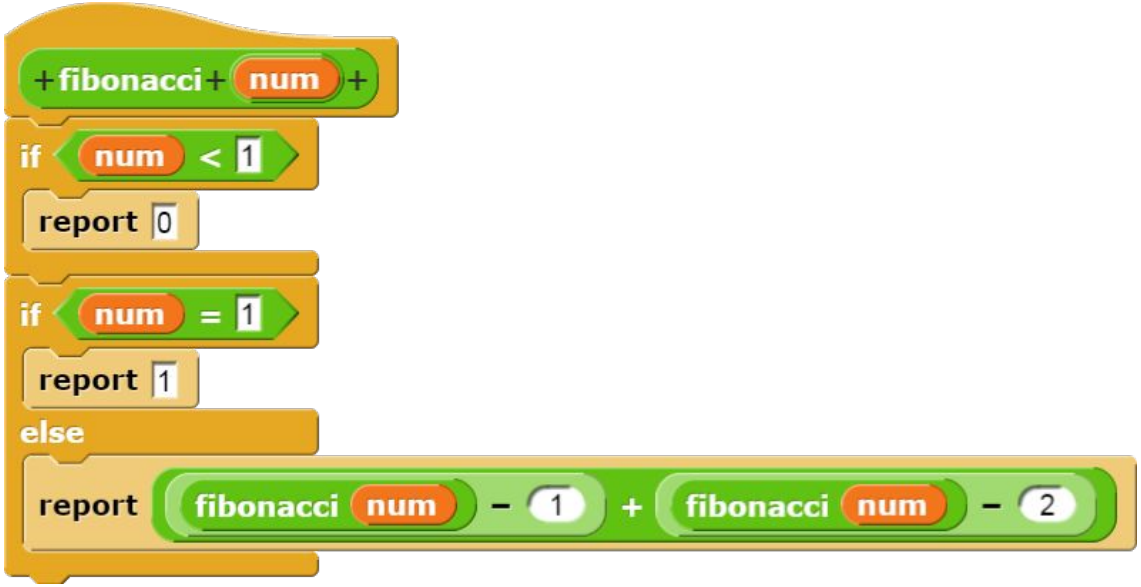
We can turn this recurrence relation into a recursive function in Snap*!*.



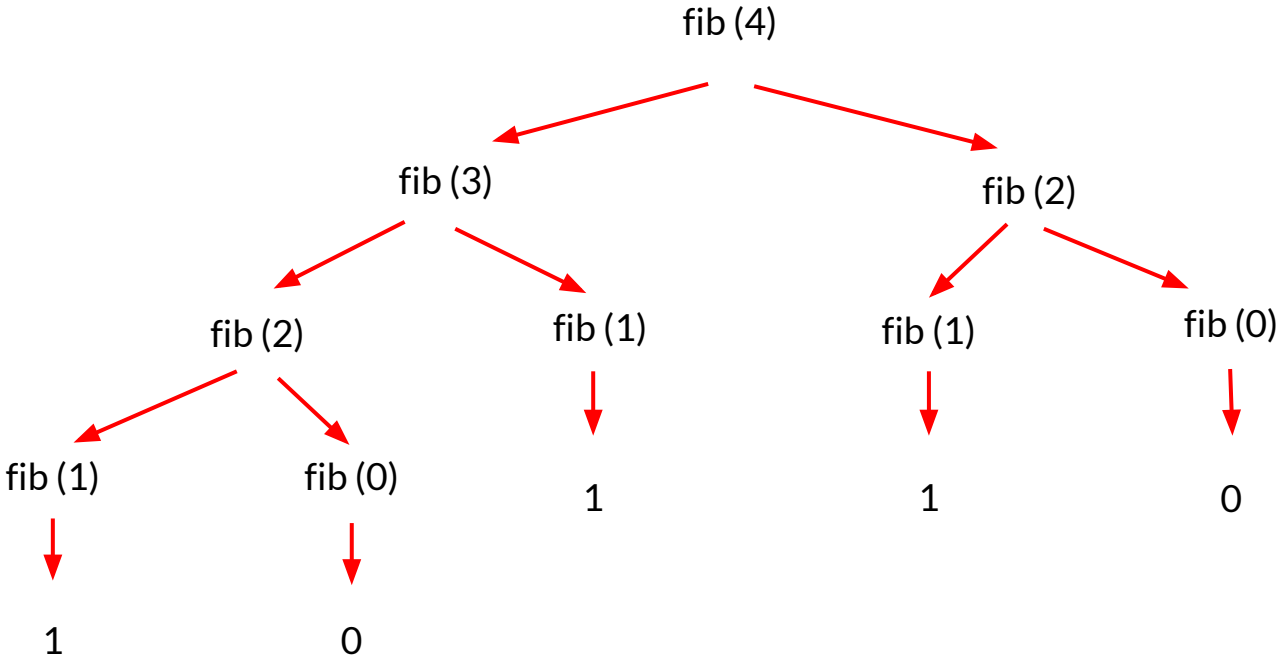
The Fibonacci Sequence

The Fibonacci block actually has 2 base cases.

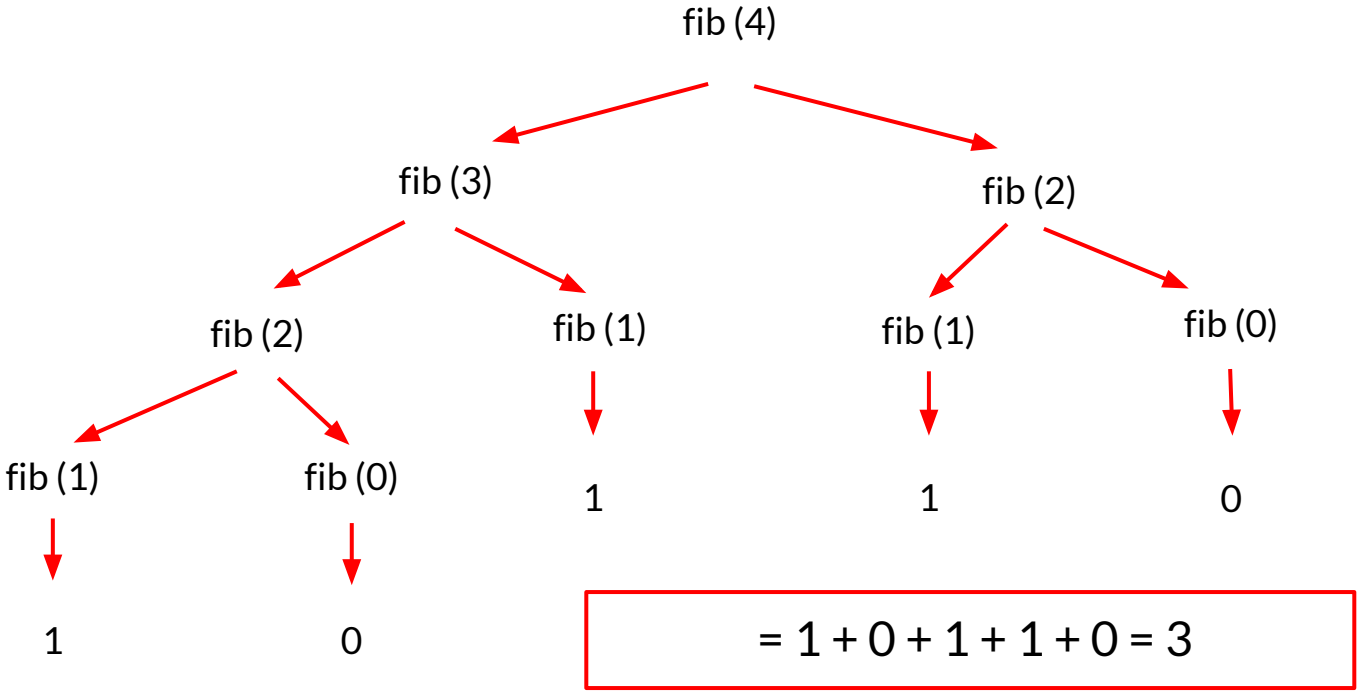
There are also 2 recursive calls of the fibonacci block in the recursive case.



The Fibonacci Sequence



The Fibonacci Sequence



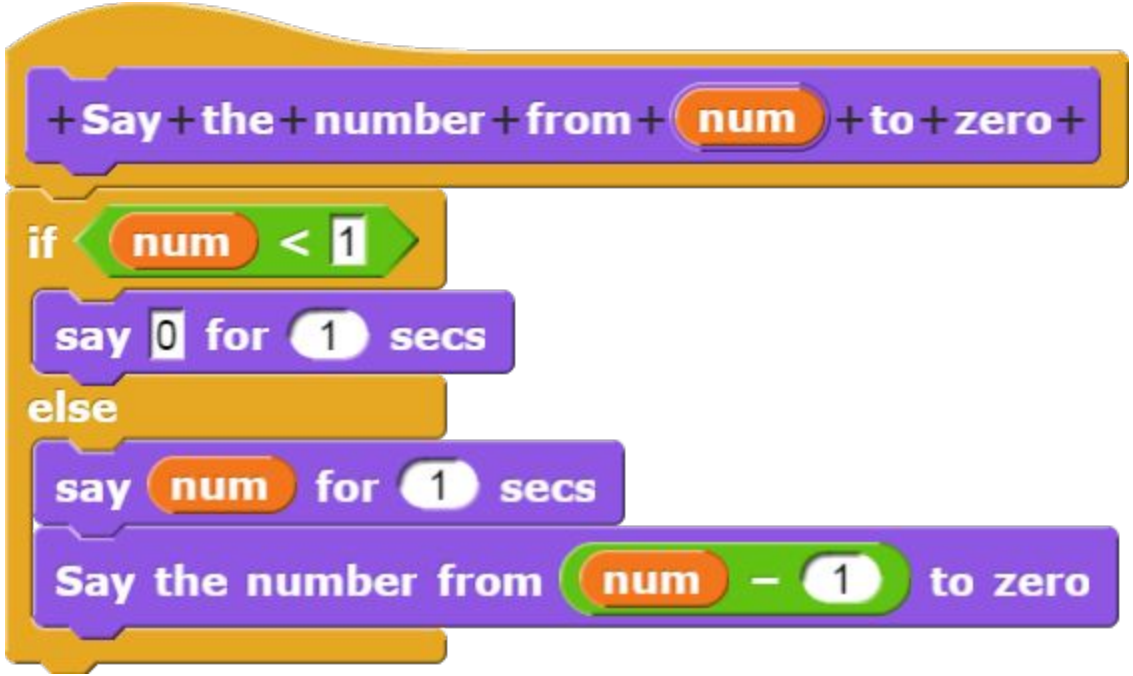
4.
Practice Problems

woohoo!

Say My Name, Say My Name

Write a block that says all numbers between an input number and 0.

Say My Name, Say My Name



I got 99 letters but a "B" ain't one.

Given a word as input, find the number of characters in the word.

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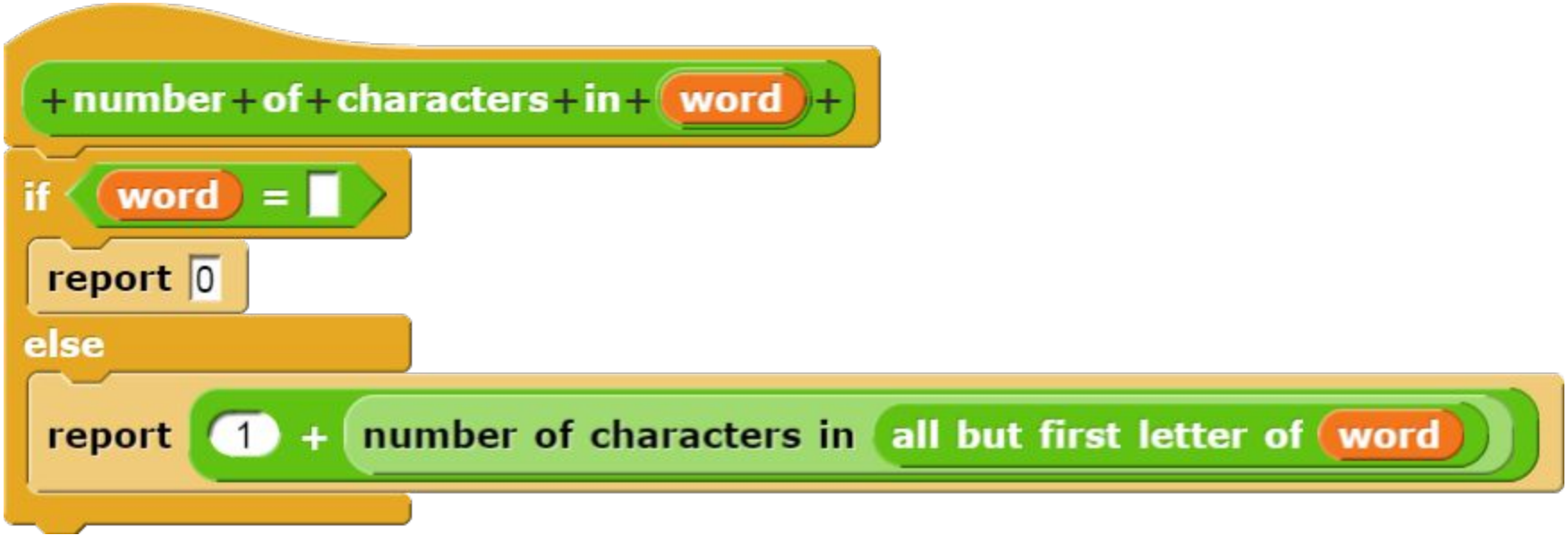
HINT

I got 99 letters but a “B” ain’t one.

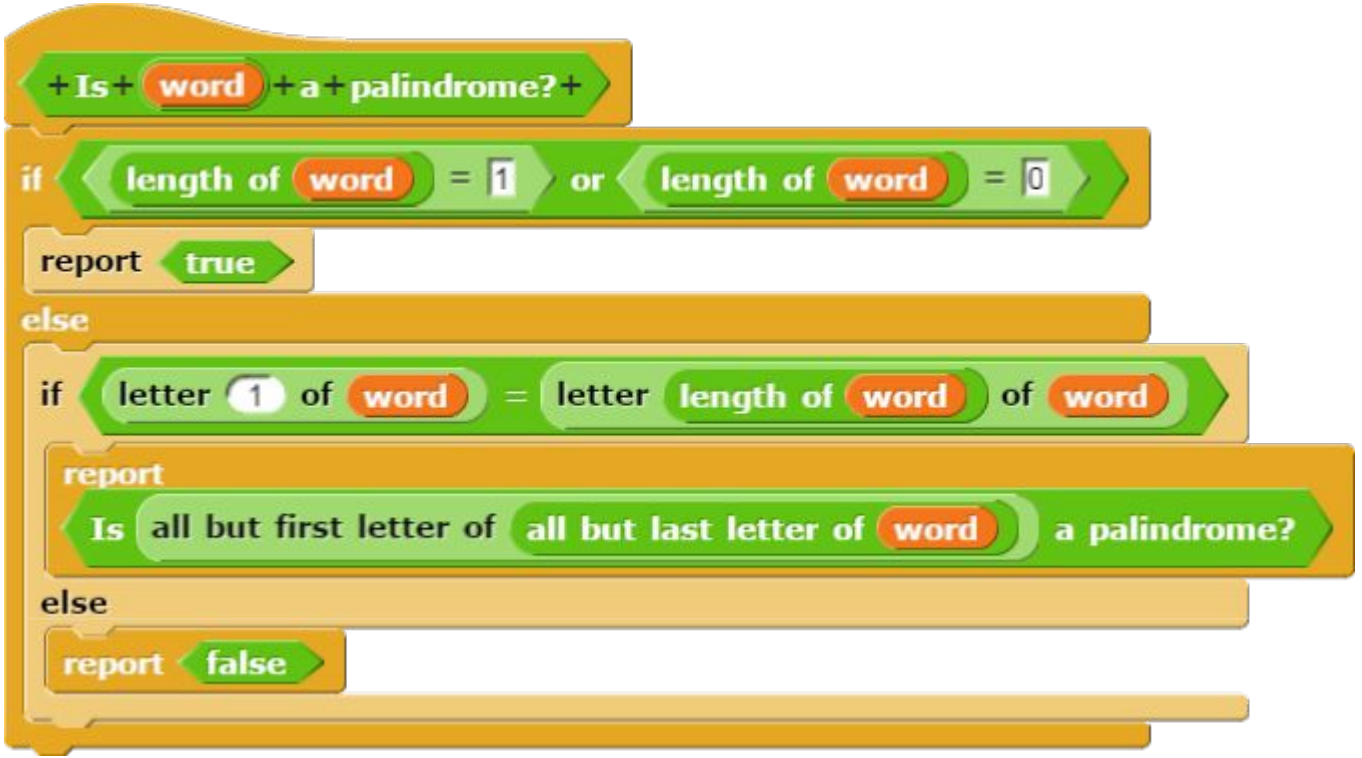


O.N.I.F.C.F.I.N.O

A palindrome is a word that is spelled the same way forwards and backwards (example: r-a-c-e-c-a-r). Given a word as an input, report whether or not the word is a palindrome.

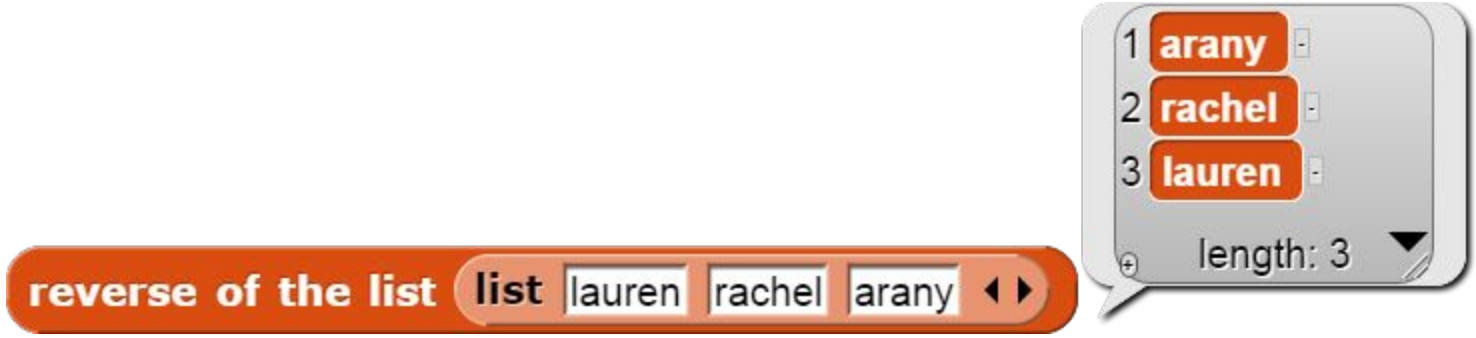
HINT

O.N.I.F.C.F.I.N.O


+Is+ word +a+palindrome?+
if length of word = 1 or length of word = 0
report true
else
if letter 1 of word = letter length of word of word
report
Is all but first letter of all but last letter of word a palindrome?
else
report false

Change Up My List

Given a list as input, report the reverse of the list.



HINT

HINT

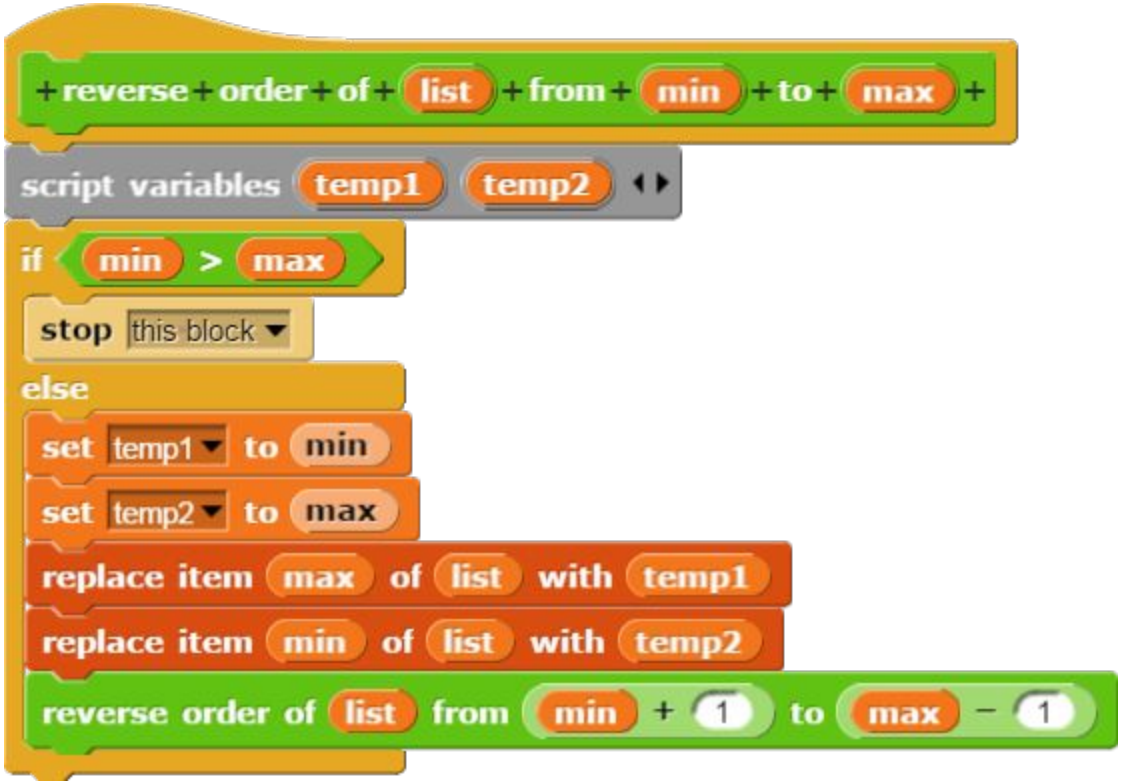
Change Up My List

Change Up (Part Of) My List

Given a list, a minimum number and maximum number as input, reverse the order of the list, but only for items within the range of the max and min.

List After Block Called

Change Up (Part Of) My List



Report Length or Die Trying

Write the 

block without using the built-in Snap*!* block.

Report Length or Die Trying

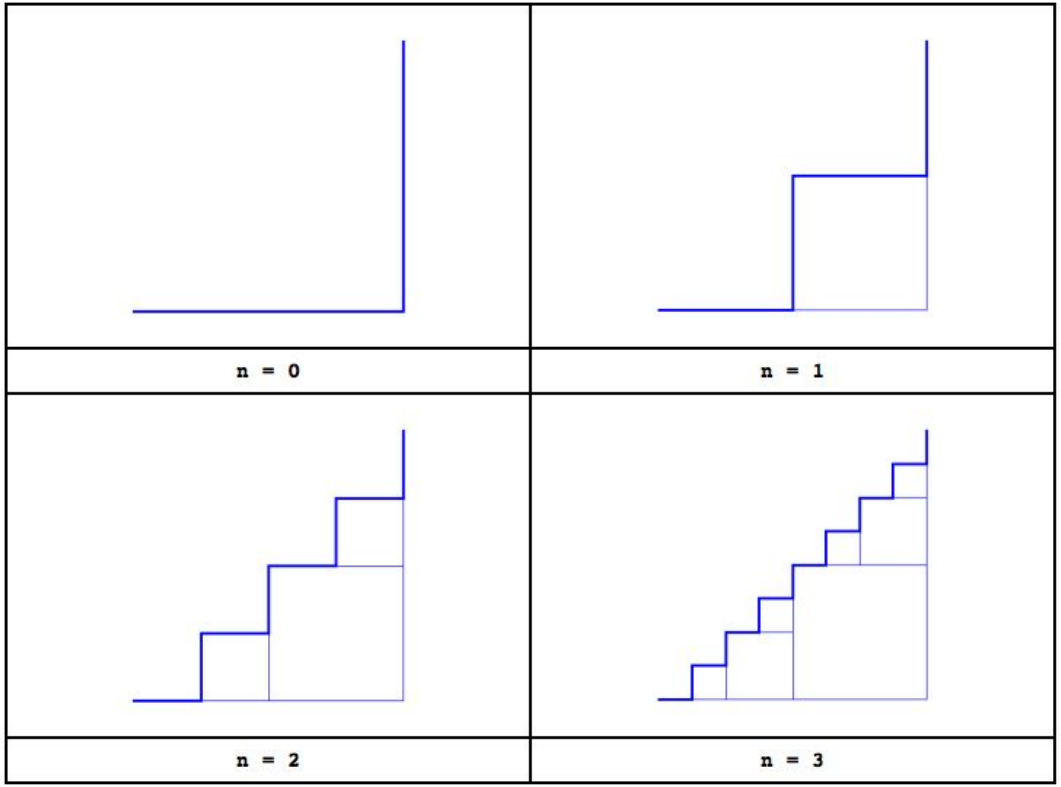
See you next week!

EXTRA (don't use FA15)

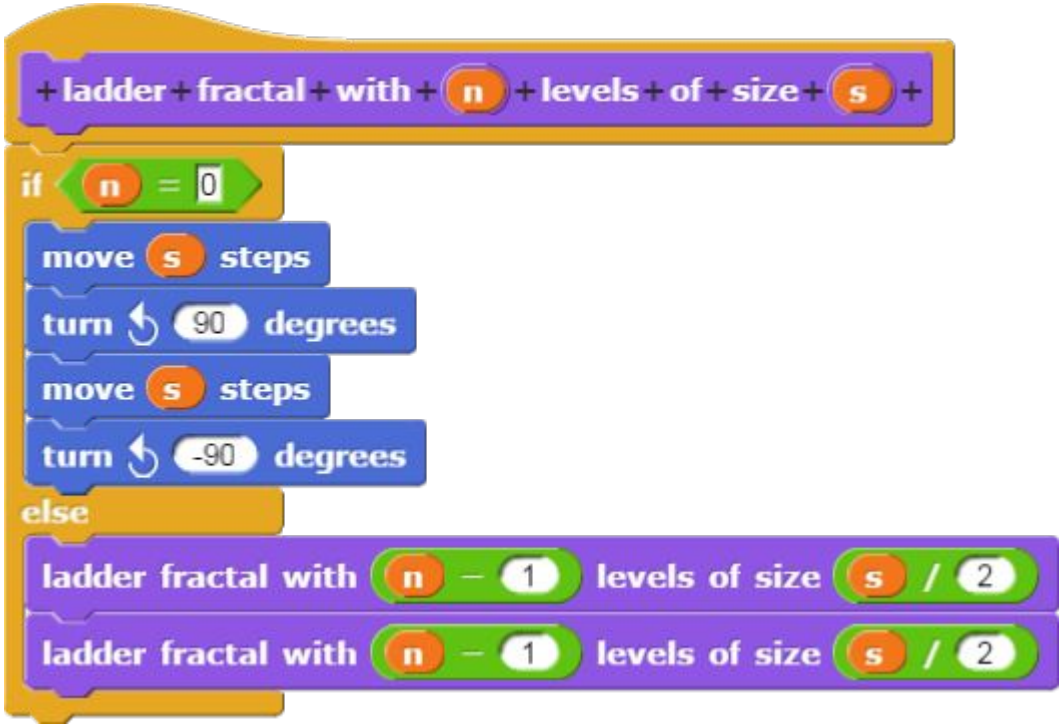
5.
Fractal Practice

woohoo!

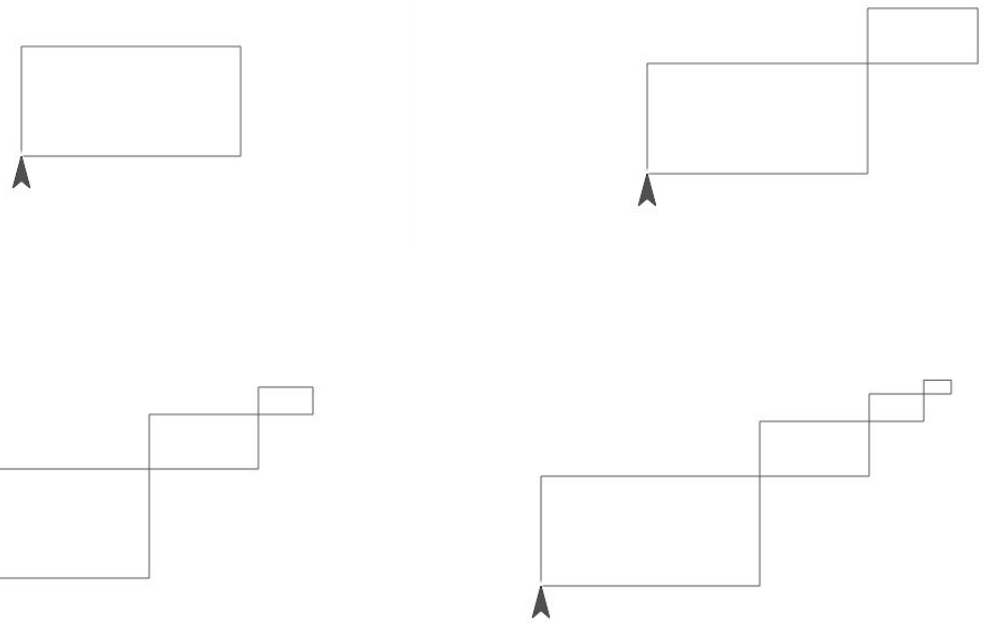
Ladder Fractal



Ladder Fractal Solution



Rectangle Fractal



Rectangle Fractal Solution