Discussion 8: Recursion II

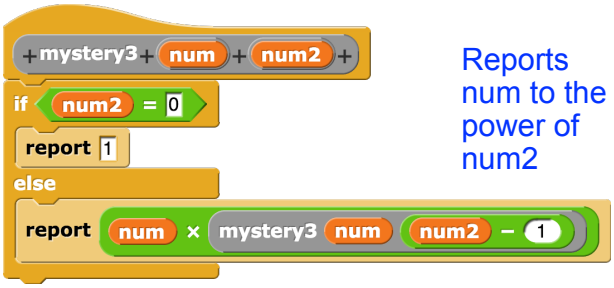
Mystery Blocks

What do each of the blocks below do?

1.

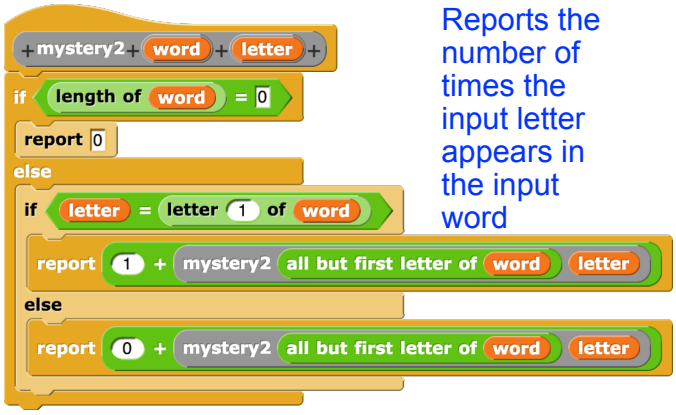
Reports whether the input list contains a number

2.



Reports num to the power of num2

3.



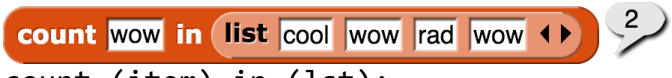
Reports the number of times the input letter appears in the input word

More Practice

a. Write a block that reports the index of the first occurrence of a letter in a word. You may assume the letter appears at least once in the word.


```
position of (letter) in (word):
if (letter) = letter 1 of (word)
      report 1
else
      report 1 + position of (letter) in (all but first of (word))
```

b. Write a block that counts the instances of an item in a list.




```
count (item) in (lst):
if empty? (lst):
    report 0
else:
    report 1 + count (item) in (all but first of (lst))
```

c. Write a block that finds the maximum item in a list of numbers. You may find the following block useful:


```
maximum item in (lst):
```

```
if length of (lst) = 1:
    report item 1 of (lst)
else:
    report max of (item 1 of (lst)) and (maximum item of (all but first of (lst)))
```

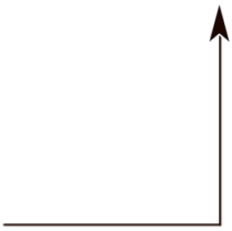
d. Write a book that takes in two lists, and reports a version of the second list without any of the items in the first list. You may find the append block, shown below, useful.


```
don't keep these: (lst1) from: (lst2):
```

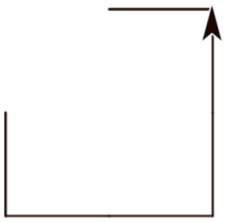
Fractal

Write out the code to create the following fractal. The sprite starts in the bottom left corner, facing right.

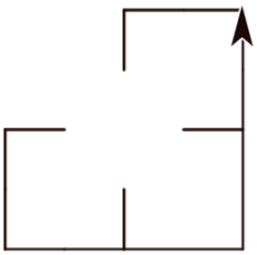
Level 1



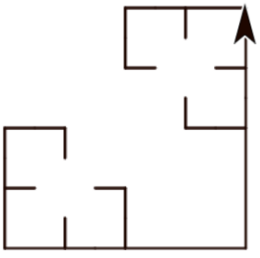
Level 2:



Level 3:



Level 4:

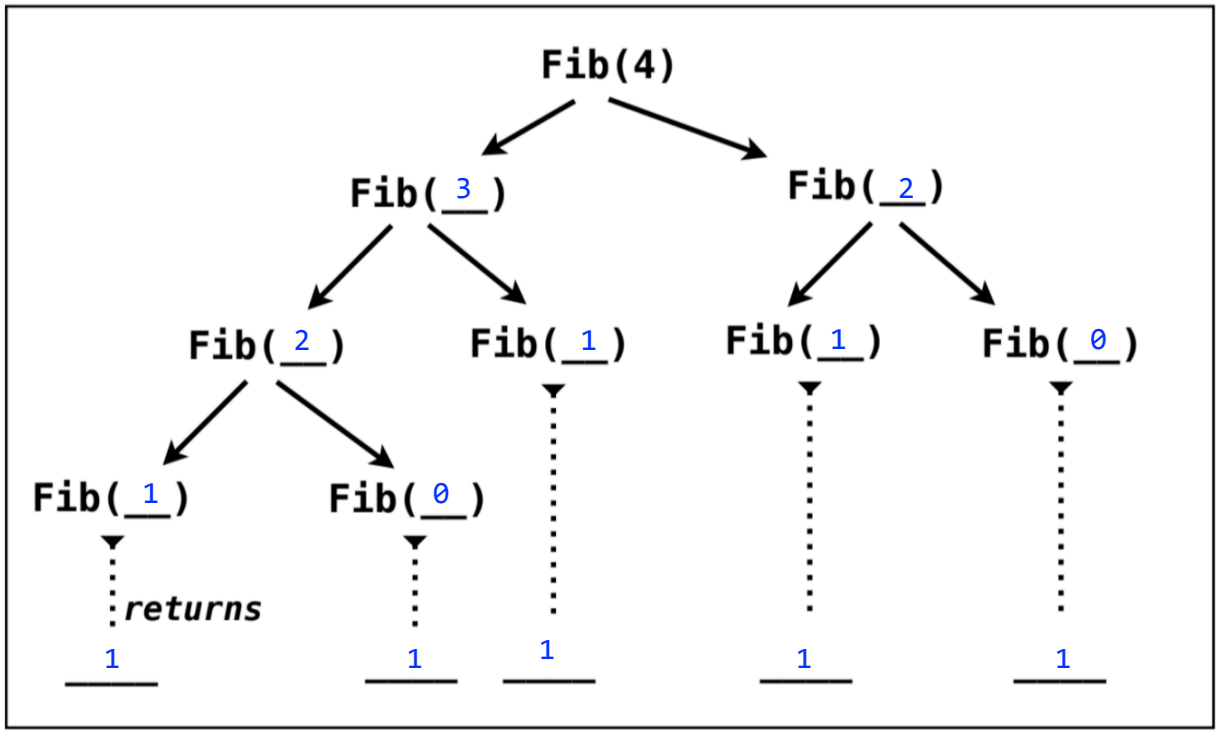


Fibonacci

The Fibonacci sequence is defined as follows: 1, 1, 2, 3, 5, etc., where each number is the sum of the two previous numbers in the sequence.
(a) Fill in the code below to find the nth Fibonacci number:

```
Fibonacci(n)
if n < 1
      report 1
else
      report Fibonacci(n - 1) + Fibonacci(n - 2)
```

(b) Now, fill out the tree below to visualize the execution of Fibonacci(4)



(c) What is the runtime of Fibonacci? Exponential