
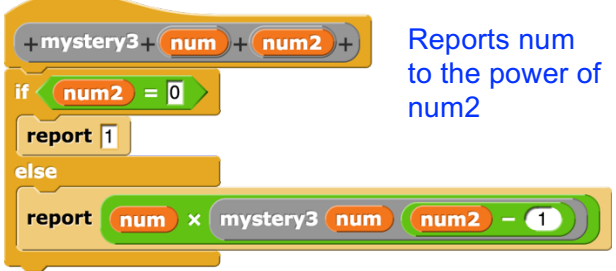


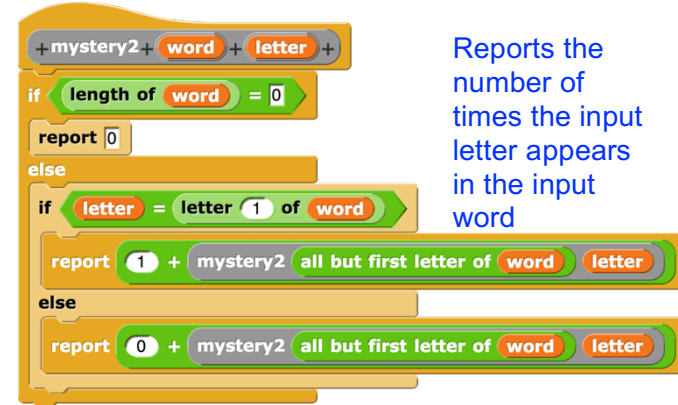
Discussion 8: Recursion II

Mystery Blocks

What do each of the blocks below do?

1.  Reports true if there is a number in the input list

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 s in oski ²

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

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

count wow in list cool wow rad wow ²

count (item) in (lst):



```
+count+ item + in + lst +
if empty? lst
  report 0
else
  if item = item 1 of lst
    report 1 + count item in all but first of lst
  else
    report 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:  4

 5

maximum item in (lst):

```

+maximum+item+of+ lst +
if 1 = length of lst
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 block 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 in front of block, shown below, useful.

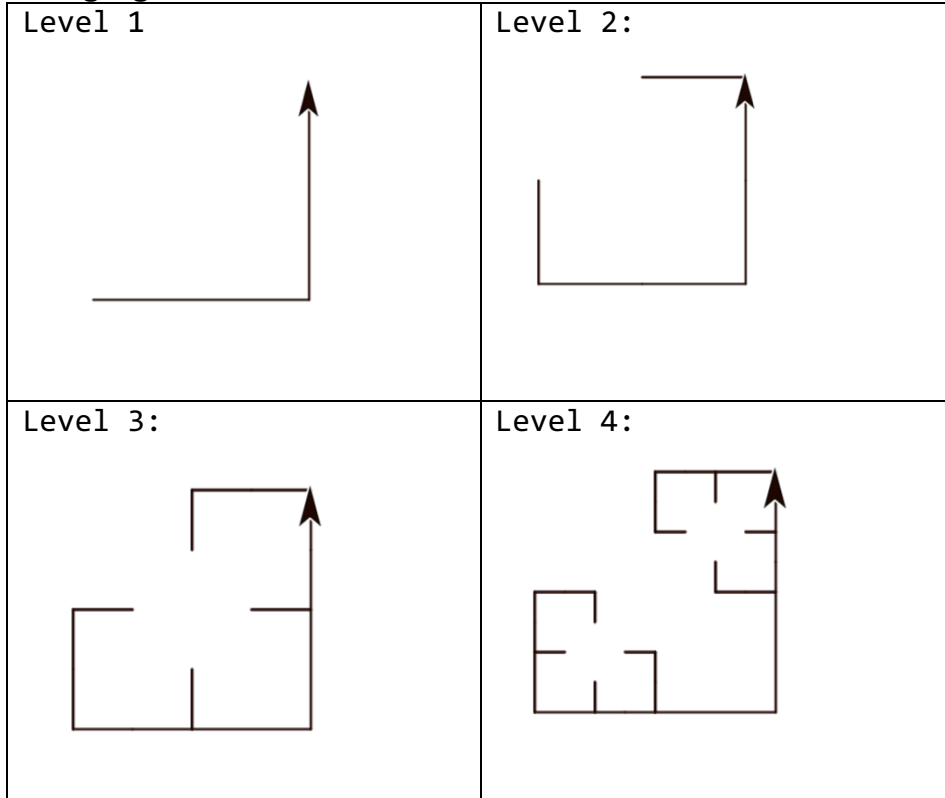
don't keep these: (lst1) from: (lst2):

```

+ dont + keep + these: + lst1 + from + lst2 +
if empty? lst2
report list
else
if lst1 contains item 1 of lst2
report dont keep these: lst1 from all but first of lst2
else
report
item 1 of lst2 in front of
dont keep these: lst1 from all but first of lst2
  
```

Fractal

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



```
+ fractal level: + level + size: + size +  
if level = 1  
  move size steps  
  turn 90 degrees  
  move size steps  
else  
  turn 90 degrees  
  move size / 2 steps  
  turn 180 degrees  
  fractal level: level - 1 size: size / 2  
  move size / 2 steps  
  turn 90 degrees  
  move size / 2 steps  
  fractal level: level - 1 size: size / 2  
  move - size / 2 steps  
  turn 90 degrees
```

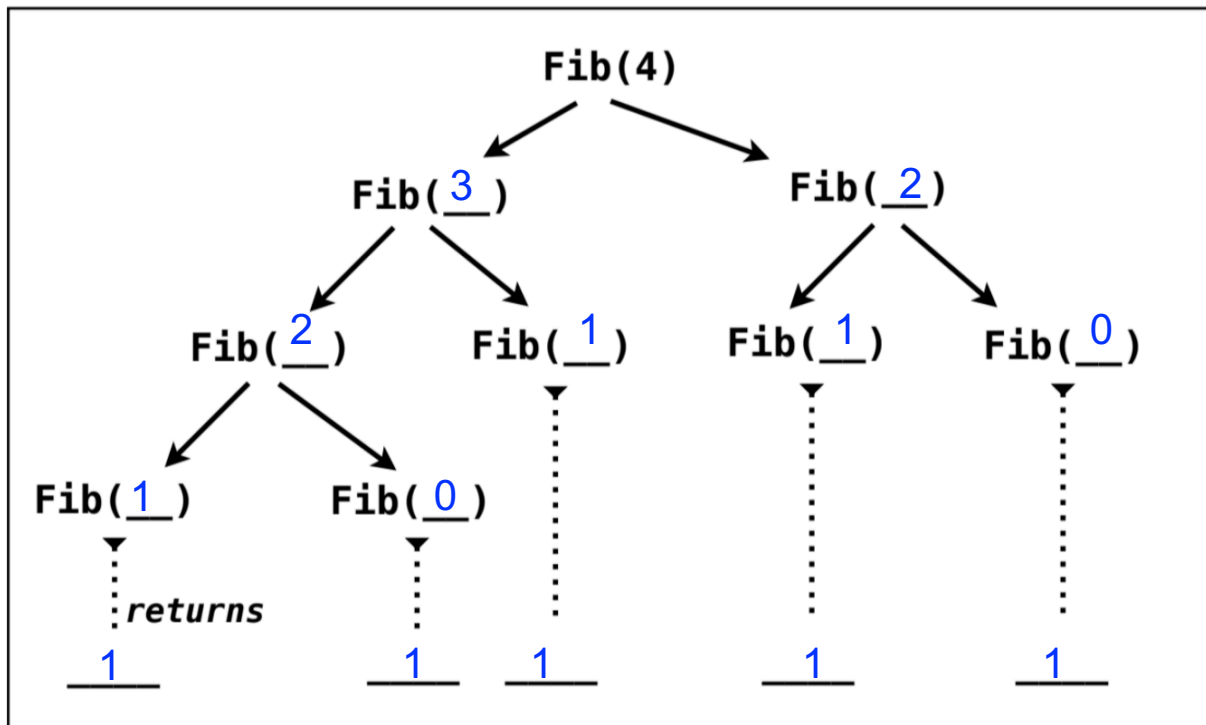
Fibonacci

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 < 2:  
  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