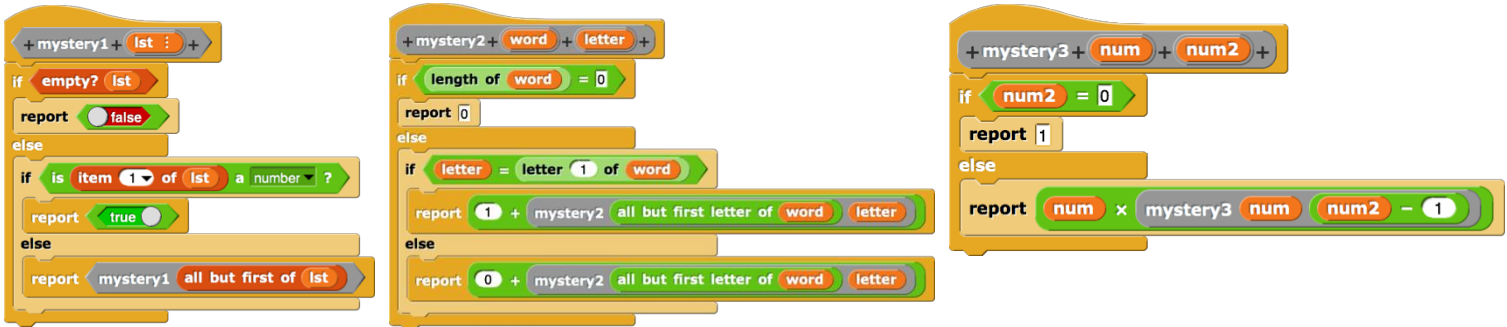


Discussion 8: Recursion II

Mystery Blocks

What do each of the blocks below do?



1. Reports true if the list contains a number
2. Reports the number of times letter appears in word
3. Exponentiates num to num2

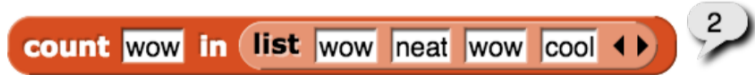
More Practice

(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.



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

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



```
count (item) in (lst):  
  if (length of (lst)) = 0  
    if (length of (lst)) = 0  
  else  
    if (item 1 of (lst)) = (item)  
      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 max item in a list. 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)) , (maximum item of (all but first of (lst))))

```

(d) Write a block that removes items in the first list from the second list. You may find the append block, pictured below, useful.



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

```

if length of (lst2) == 0
  report (lst2)
else
  if < (lst1) contains (item (1) of (lst2))
    report ( dont keep these (lst1) from (all but first of (lst2)) )
  else
    report (append (item (1) of (lst2) (dont keep these (lst1) from (all but first of (lst2)))) )

```

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:

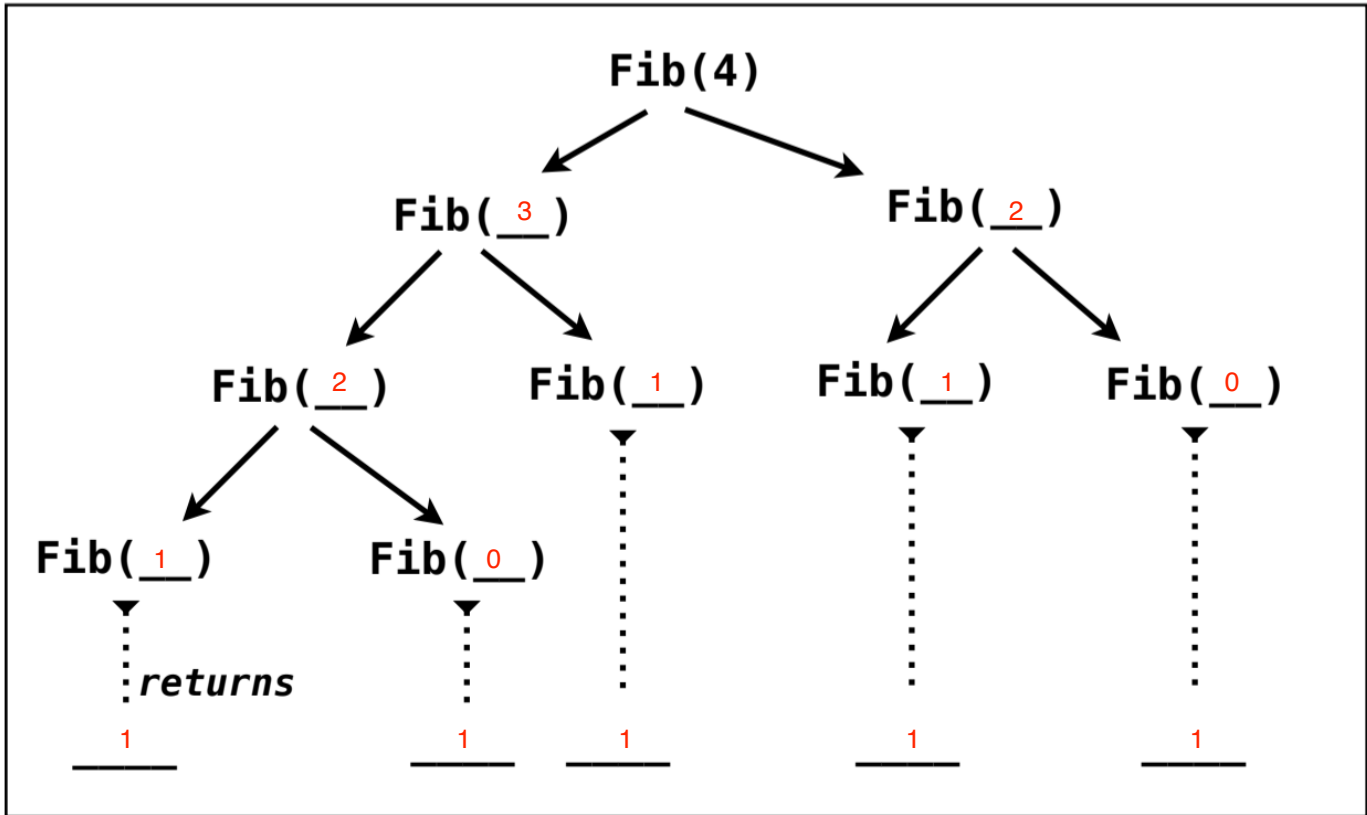
```
Fibonacci (n)
```

```

if  n = 0  _____ :
  report  1  _____
if  n = 1  _____ :
  report  1  _____
else:
  report  Fibonacci(n-1) + Fibonacci(n-2)  _____

```

(b) Fill in the recursive tree below representing the call: Fib(4)



(c) What is the runtime of Fibonacci? exponential