Discussion 4: Algorithmic Complexity + Programming Paradigms

Algorithmic Complexity: Definitions

1. What is runtime? How do we measure it?

_____

_____

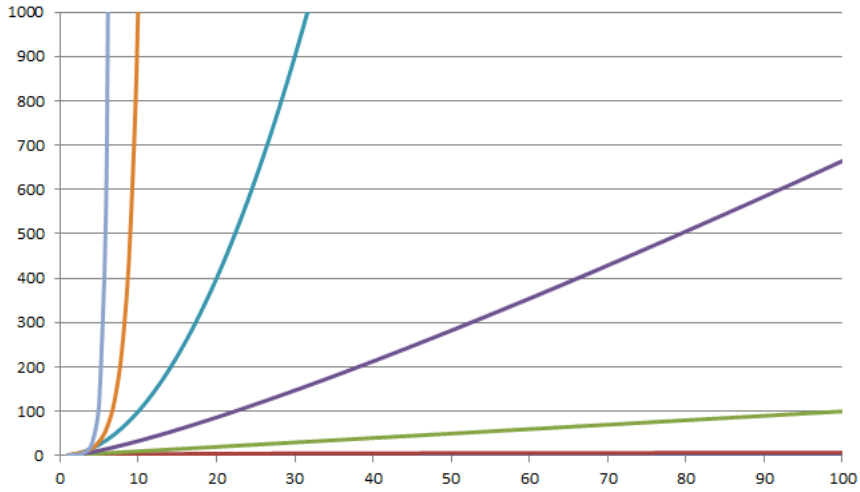
2. If a function runs in O(n) time, that means it runs…
   O in linear time at worst O in linear time on average O in linear time at best

Understanding Runtimes

1. Fill in the following chart:

Runtime	Notation	As input size increases by…	The number of steps change by…
Constant		+1	
Logarithmic		x2	
Linear		+1	
Quadratic		x2	
Exponential (base B)		+1	

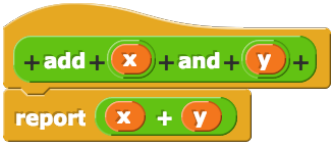
2. In the following diagram, label each of lines. Which is the best runtime? The worst?



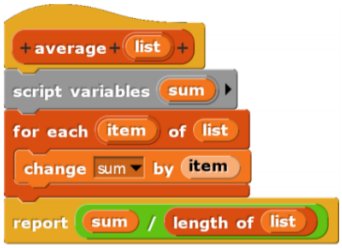
Runtime: Practice

1. Find the runtime of the following blocks or descriptions of blocks:

a.



b.



c.

d. This block takes in a value and a list and searches through every item in the list one by one to see if it can find that value.

e. This block takes in a value and a sorted list and searches for the value in the sorted list. Every iteration of the algorithm, it figures out which half of the list the value would be in, and then only searches in that half of the list.

Programming Paradigms

1. Write down the programming paradigm that **best** fits the following descriptions:

   a. One sprite tells a second sprite to run some code. The second sprite does it.

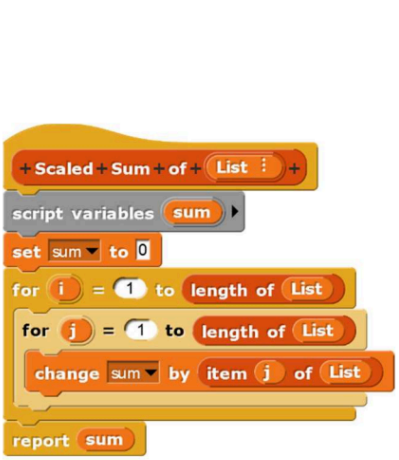
   b. You input a global list into a block. It reports a new list with different values, without modifying the input list.

   c. You give a program a condition as an input and it uses this condition to remove numbers from a list. You input a list and it removes items.

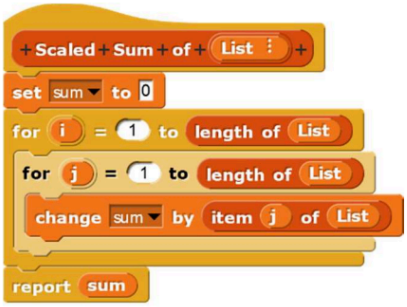
   d. You have a global variable set to a secret word. You change the secret word every time you ask a player for a new secret word.

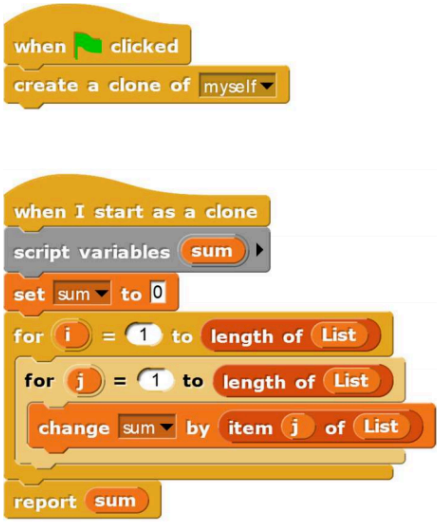
2. Match each of the following scripts to a programming paradigm:

_____ _____ _____



Assume `sum` *is a global variable in the second script*





Challenge

1. What does the following block do? What is its runtime?

2. If myList is a list of n words, each of length n, what is the runtime of the following block?