

RUNTIME

1. $O(n)$ where n is how many animal crackers are in the box
2. $O(1)$ – constant
 $O(\log n)$ – slightly better than n
 $O(n)$ – linear
 $O(n \log n)$ – slightly worse than n
 $O(n^2)$ – quadratic
 $O(2^n)$ – exponential
 $O(n!)$ – fractural (just adding for reference)

STACKS AND QUEUES

1. $O(n)$ where n is how many animal crackers are in the box
 - a. stack
 - b. queue
 - c. queue
2. Queue (FIFO): bank processing transactions to an account, reading a book series, instructions on how to tie shoes, calculators by introducing prefix and postfix at the same time, digestion (add to the back, but take off from the front only)
3. Stack (LIFO): caching, piles of paper on a desk, storing items in a room where you will need them next – umbrella by the back door, vacuum bags behind the couch in the living room (remove one at a time in the order of last received)

LINKED LISTS

1. Linked List has a head attribute and a tail attribute. There are three nodes in the list.

apple – Node: two attributes, data and next.
apple.data = "Apple"
apple.next = "Berry"

berry – Node: two attributes, data and next.
berry.data = "Berry"
berry.next = "Cherry"

cherry – Node: two attributes, data and next.
cherry.data = "Cherry"
cherry.next = "None"

ll.head = apple
ll.tail = cherry

2. Singly linked links have pointers in one direction only - Doubly-linked links have pointers in both directions
3. If we maintain a tail attribute, we always have access to the last item in the list and do not have to follow the length of the list in order to reach the end. It doesn't matter how long the list is, we can append without caring.
 $O(1)$

TREES

Breadth First Search – horizontal, rows or layers at a time

Depth First Search – vertical, columns at a time

1. Breadth First Search – requires a queue

Italian

Indian

Mexican

Lasagna

Pizza

Tikka masala

Saag

Burritos

2. Depth First Search – requires a stack

Italian

Lasagna

Pizza

Thin crust

Chicago style

3. With every step added in a binary search tree, roughly half of the options are removed. A binary search tree is only possible if the data itself has an intrinsic natural order.