

Arrays (12 Points)

- a. $4 \times 20 = 80$ b. $7 \times 8 = 56$ c. $12 \times 8 = 96$
d. $(6200-6000)/4 = 50$ e. $8000+10 \times 8 = 8080$ f. $8000+10 \times 1 = 8010$

Vocabulary (16 points)

- a. Abstract data type (ADT) vs. a class implementing a data structure in Java
Both describe ways of storing data. An ADT describes the operations that are allowed and how they function, without specifying a particular implementation. A data structure class specifies a particular way to put those operations into practice
- b. Singly linked list vs. doubly linked list
Both represent sequences using nodes with links between them. The links on a singly linked list only allow traversal through the list in the forward direction, while those on a doubly linked list allow traversal in either direction.
- c. Iterator vs. index
Both can be used to represent position in a sequence, often for purposes of iteration. The iterator is an abstract representation of position that can be applied to many different data structures, whether sequential or not. The index is most useful with arrays, although it can also be applied to other sequential data structures.
- d. Java built-in array vs ArrayList
Both store data consecutively in blocks of memory. The built-in array doesn't offer much functionality besides storage and lookup, while ArrayList is a class that offers a number of useful methods including shuffling and sorting.

Data Structure Selection (8 points)

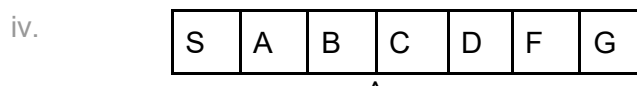
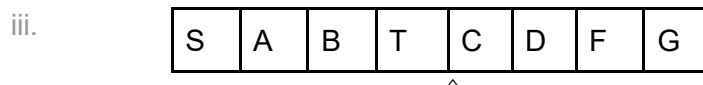
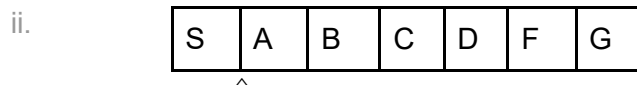
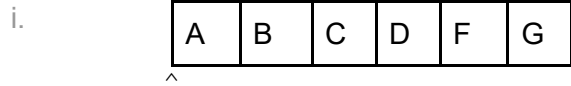
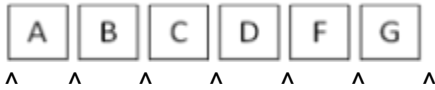
- a. Either *You need to look at every single name until you find your own. Since the names are not ordered, on average you will need to look at half of them*
- b. Linked List *Inserting at the front requires a small constant number of operations for a linked list, but requires copying all the elements for an array.*
- c. Either *Setting a value in an array, and setting the value at a particular position through an iterator both take a constant number of steps, regardless of the number of items.*
- d. Doubly Linked List *The doubly linked list has references to the elements before and after, but the singly linked list only has references to the one after.*

Copy Types (16 Points)

- a. C & D, G & H
b. F & G, F & H, B & E
c. A & C, A & D

Iterators (10 Points)

a. Below, indicate each position that a list iterator can occupy as it moves through the list.



Linked Lists (20 Points)

- Method A: _T_____
- Method B: _None__
- Method C: _Y_____
- Method D: _Y_____
- Method E: _P_____
- Method F: _None__
- Method G: _None__
- Method H: _Q_____
- Method I: _R_____
- Method J: _Y_____

- Picture P: _E_____
- Picture Q: _H_____
- Picture R: _I_____
- Picture S: _____
- Picture T: _A_____
- Picture U: _____
- Picture V: _____
- Picture W: _____
- Picture Y: _C,D,J_
- Picture Z: _____

Loop Invariants (6 Points)

- a. Initial conditions for the i loop _IV_____
- b. Initial conditions for the j loop _V_____
- c. Desired outcome of i loop II_____
- d. Desired outcome of j loop _VI_____
- e. Loop invariant for the i loop _III_____
- f. Loop invariant for the j loop I_____