CSE 12 Week Four, Lecture One

List object:
What: - a container object made up of ____________

Node objects:
What:
- the __________ of a List
- one Node per item __________________________

List type:
head pointer: points to the ____________________.
end pointer: points to the ________________.

Node type:
pre, next: points to the ____________________.

Linked list:
Single linked list:
- One _____ pointer, optional _____ pointer.
- Multiple Nodes with _____ pointers.
- End of the List has _____ pointer with value of _____

Problems/limitations:
- Only go _______: (solution: use a double-linked list)
- Separate code to insert/remove in the middle/end.
- Could have an optional “end” pointer:
  o Short cut to reach the end of the list.

Double linked list:
- One _____ pointer and/or one _____ pointer.
- Multiple Nodes with _____ and _____ pointers.
- End of the List has _____ pointer with value of _____.
- Front of the List has ____ pointer with value of _____.

Problems/limitations:
- Separate code to insert/remove at the front/middle/end.
- Solved by implementing a circular linked list.
Circular linked list:
- One ______ pointer and/or one ______ pointer.
- Multiple Nodes with _____ and _____ pointers.
- The front and the end of the list are implied through _____
- Benefit:
  o Inserting/Removing from the front/middle/end is inserting/removing between two Nodes.
    ▪ Insert/Remove at front, additionally update ______ pointer (if we had a “front” pointer).
    ▪ Insert/Remove at end, additionally update the ______ pointer (hw5).
  o One set of code to perform the Node insertion regardless of the location in the list where the insertion occurs.

Non-detailed drawing of inserting at front and end of a circular list:

Insert at front                             Insert at end

When using pointers in linked lists, note:
- All pointers point to the ______________ for that Node.
- All Nodes are allocated in the _____ section of memory.
- We are going to allocate the List ________, too.
  o The Nodes/List objects allocated from the heap are ________________.
  o You can only access them ________________.
- Storage in the List is limited by heap memory.
  o No “is_full_List” method is needed.

Our use of a linked list will be to implement a Stack:
  Push:  insert at the ________________
  Pop:  remove from the ________________
  Top: viewing of the item at the ______________
What part of your program should allocate the objects to store in a generic container?

1. Driver program/main method allocates objects.
   a. Container stores ________________

or

2. Container allocates objects
   a. Container gets ________________
   b. Creates and stores ________________.

Hw5: Two driver programs exist: driver1, driver2
Purpose: _________________________________.

Philosophy:
- driver1:
  o ______ allocates object to be stored inside ______.
  o List stores ________________.
  o Driver passes ________ pointer to the list code.
  o Passed in object is allocated ________________.
  o List stores ________________________________.

- driver2:
  o ______ allocates object to be stored inside ______.
  o List stores ________________.
  o Driver passes ________ pointer to the list code.
  o Passed in object is allocated ________________.
    ▪ Therefore, it ______the value directly stored.

User detects ______ differences between driver1 and driver2.
Efficiency:
What: A concept describing how good or bad a particular algorithm is.
Why: We want to save time and resources.
- Time example: How long does it take for a computer to produce a result?
  o Real time systems have real-time requirements.
  o Users don’t want to wait too long for results.
- Resource example: Customers billed by CPU cycle usage.

How do we measure:
- Select an aspect of our algorithm to identify as a unit of work.
- Then count it.

How do we compare efficiencies: Big-O (Wikipedia)
- In computer science, big O notation is used to classify algorithms by how they respond (e.g., in their processing time or working space requirements) to changes in input size.
- Not precise.
  o Constants are ignored
  o Lower order polynomial terms are ignored.

\[ O(3n^3 + 5n^2 + 45n + 2) = \text{__________} \]

\( n = \) number of items in your data set

Best Efficiency: _______
What: Amount of work performed is ________________
______________________________________________.