

1 Boxes and Pointers

Draw a box and pointer diagram to represent the IntLists L1, L2, and L3 after each statement.

```
1 IntList L1 = IntList.list(1, 2, 3);
2 IntList L2 = new IntList(4, L1.rest);
3 L2.rest.first = 13;
4 L1.rest.rest.rest = L2;
5 IntList L3 = IntList.list(50);
6 L2.rest.rest = L3;
```

2 Partition

Implement `partition`, which takes in an `IntList lst` and an integer `k`, and *destructively* partitions `lst` into `k` `IntLists` with the following properties:

- It is the **same** length as the other lists. You may assume the `IntList` is evenly divisible.
- Its ordering is consistent with the ordering of `lst`, i.e. items in earlier in `lst` must **precede** items that are later.

These lists should be put in an array of length `k`, and this array should be returned.

For instance, if `lst` contains the elements 6, 5, 4, 3, 2, 1, and `k = 2`, then a **possible** partition, is putting elements [6, 4, 2] at index 0, and elements [5, 3, 1] at index 1.

You may assume you have the access to the method `reverse`, which destructively reverses the ordering of a given `IntList` and returns a pointer to the reversed `IntList`. **Hint:** Think about how to build up the `IntList` backward at each index, starting with `null`.

You may not create any `IntList` instances.

```

1  public static IntList[] partition(IntList lst, int k) {
2      IntList[] array = new IntList[k];
3      int index = 0;
4      IntList L = _____
5      while (L != null) {
6
7          _____
8
9          _____
10
11         _____
12
13         _____
14
15         _____
16
17         _____
18
19         index = _____ % _____;
20     }
21     return array;
22 }
```

3 Remove Duplicates

Using the simplified `DLList` class defined on the next page, implement the `removeDuplicates` method.

`removeDuplicates` should remove all duplicate items from the **DLList**. For example, if our initial list is `[8, 4, 4, 6, 4, 10, 12, 12]`, our final list should be `[8, 4, 6, 10, 12]`. You may **not** assume that duplicate items are grouped together, or that the list is sorted!

```

1  public class DLLlist {
2      Node sentinel;
3
4      public DLLlist() {
5          // ...
6      }
7
8      public class Node {
9          int item;
10         Node prev;
11         Node next;
12     }
13
14     public void removeDuplicates() {
15
16         Node ref = _____;
17         Node checker;
18
19         while (_____ ) {
20
21             checker = _____;
22
23             while (_____ ) {
24
25                 if (_____ ) {
26
27                     Node checkerPrev = checker.prev;
28                     Node checkerNext = checker.next;
29
30                     _____;
31
32                     _____;
33
34                     _____;
35
36                     checker = _____;
37                 } else {
38
39                     checker = _____;
40                 }
41             }
42
43             ref = _____;
44         }
45     }
46 }

```