

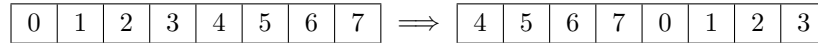
## 1 Static Electricity

```
1 public class Pokemon {
2     public String name;
3     public int level;
4     public static String trainer = "Ash";
5     public static int partySize = 0;
6
7     public Pokemon(String name, int level) {
8         this.name = name;
9         this.level = level;
10        this.partySize += 1;
11    }
12
13    public static void main(String[] args) {
14        Pokemon p = new Pokemon("Pikachu", 17);
15        Pokemon j = new Pokemon("Jolteon", 99);
16        System.out.println("Party size: " + Pokemon.partySize);
17        p.printStats();
18        int level = 18;
19        Pokemon.change(p, level);
20        p.printStats();
21        Pokemon.trainer = "Ash";
22        j.trainer = "Cynthia";
23        p.printStats();
24    }
25
26    public static void change(Pokemon poke, int level) {
27        poke.level = level;
28        level = 50;
29        poke = new Pokemon("Luxray", 1);
30        poke.trainer = "Team Rocket";
31    }
32
33    public void printStats() {
34        System.out.println(name + " " + level + " " + trainer);
35    }
36 }
```

- (a) Write what would be printed after the `main` method is executed.
  
  
  
  
  
  
  
  
  
  
- (b) On line 28, we set `level` equal to 50. What `level` do we mean?
  - A. An instance variable of the `Pokemon` object
  - B. The local variable containing the parameter to the `change` method
  - C. The local variable in the `main` method
  - D. Something else (explain)
  
  
  
  
  
  
  
  
  
  
- (c) If we were to call `Pokemon.printStats()` at the end of our `main` method, what would happen?

## 2 Rotate *Extra*

Write a function that, when given an array A and integer k, returns a *new* array whose contents have been shifted k positions to the right, wrapping back around to index 0 if necessary. For example, if A contains the values 0 through 7 inclusive and k = 12, then the array returned after calling `rotate(A, k)` is shown below on the right:



k can be arbitrarily large or small - that is, k can be a positive or negative number. If k is negative, shift k positions to the left. After calling `rotate`, A should remain unchanged.

*Hint: you may find the modulo operator % useful. Note that the modulo of a negative number is still negative (i.e.  $(-11) \% 8 = -3$ ).*

*/\*\* Returns a new array containing the elements of A shifted k positions to the right. \*/*

```
public static int[] rotate(int[] A, int k) {
    int rightShift = _____;
    if (_____) {
        _____;
    }

    int[] newArr = _____;
    for (_____) {
        int newIndex = _____;
        _____;
    }
    return newArr;
}
```

### 3 Cardinal Directions

Draw the box-and-pointer diagram that results from running the following code. A `DLLStringNode` is similar to a `Node` in a `DLLList`. It has 3 instance variables: `prev`, `s`, and `next`.

```

1  public class DLLStringNode {
2      DLLStringNode prev;
3      String s;
4      DLLStringNode next;
5      public DLLStringNode(DLLStringNode prev, String s, DLLStringNode next) {
6          this.prev = prev;
7          this.s = s;
8          this.next = next;
9      }
10     public static void main(String[] args) {
11         DLLStringNode L = new DLLStringNode(null, "eat", null);
12         L = new DLLStringNode(null, "bananas", L);
13         L = new DLLStringNode(null, "never", L);
14         L = new DLLStringNode(null, "sometimes", L);
15         DLLStringNode M = L.next;
16         DLLStringNode R = new DLLStringNode(null, "shredded", null);
17         R = new DLLStringNode(null, "wheat", R);
18         R.next.next = R;
19         M.next.next.next = R.next;
20         L.next.next = L.next.next.next;
21
22         /* Optional practice below. */
23
24         L = M.next;
25         M.next.next.prev = R;
26         L.prev = M;
27         L.next.prev = L;
28         R.prev = L.next.next;
29     }
30 }
```

## 4 Gridify

- (a) Consider a circular sentinel implementation of an SLList of Nodes. For the first `rows * cols` Nodes, place the item of each Node into a 2D `rows × cols` array in row-major order. Elements are sequentially added filling up an entire row before moving onto the next row.

For example, if the SLList contains elements  $5 \rightarrow 3 \rightarrow 7 \rightarrow 2 \rightarrow 8$  and `rows = 2` and `cols = 3`, calling `gridify` on it should return this grid.

5	3	7
2	8	0

**Note:** If the SLList contains fewer elements than the capacity of the 2D array, the remaining array elements should be 0; if it contains more elements, ignore the extra elements.

*Hint: Java's / operator floor-divides by default. Can you use this along with % to move rows?*

```

1  public class SLList {
2      Node sentinel;
3
4      public SLList() {
5          this.sentinel = new Node();
6      }
7
8      private static class Node {
9          int item;
10         Node next;
11     }
12
13     public int[][] gridify(int rows, int cols) {
14         int[][] grid = _____;
15         _____;
16         return grid;
17     }
18
19     private void gridifyHelper(int[][] grid, Node curr, int numFilled) {
20         if (_____ ) {
21             return;
22         }
23
24         int row = _____;
25         int col = _____;
26
27         grid[row][col] = _____;
28         _____;
29
30     }
31 }

```

- (b) Why do we use a helper method here at all? i.e., why can't the signature simply be `gridify(int rows, int cols, Node curr, int numFilled)`, omitting `gridifyHelper` entirely?