1 Static Electricity

On line 19, we first change p's level to 18, and then local var level, from 18 to 50.
then we create a new obj of Pokemon and assign it to the poke, but as poke and p were pointing at the same address, this wont affect <u>object p</u>.
then we change, this new objects(poke) trainer, but it affects for all other objects of Pokemon, as trainer is a static var.

```
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);   ↗ 2
17         p.printStats();   → Pikachu 17 Ash
18         int level = 18;
19         Pokemon.change(p, level);
20         p.printStats();   → Pikachu 18 Team Rocket
21         Pokemon.trainer = "Ash";   here we once again change the static var for Pokemon
22         j.trainer = "Cynthia";   here same ↗
23         p.printStats();   → Pikachu 18 Cynthia
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)

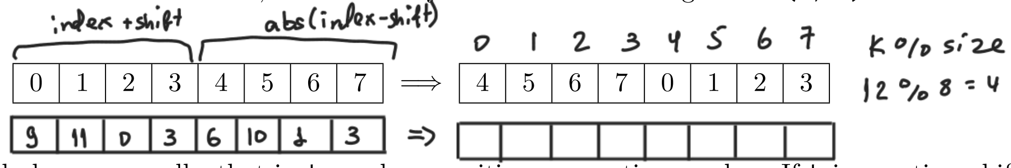
we invoke this method on Pokemon class, and give corresponding parameters. we're referring to the variable in the scope of the function.

(c) If we were to call `Pokemon.printStats()` at the end of our main method, what would happen?

this method is nonstatic, so its an instance method, we can call static methods from class, like Pokemon.change(); printStats has to be called on particular instance of Pok class. Even if we look into this method, it doesnt make sense, as name/level isnt assigned.

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:

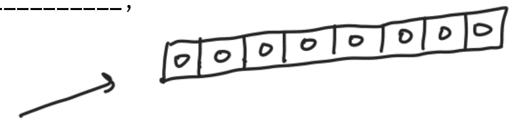


k can be arbitrarily large or small - that is, k can be a positive or negative number. If k is negative, shift k positions to the left. After calling rotate, A should remain unchanged.

if k = -1 then [1|2|3|4|5|6|7|0] as if k = 6 so new index = (i + shift)%A.length

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

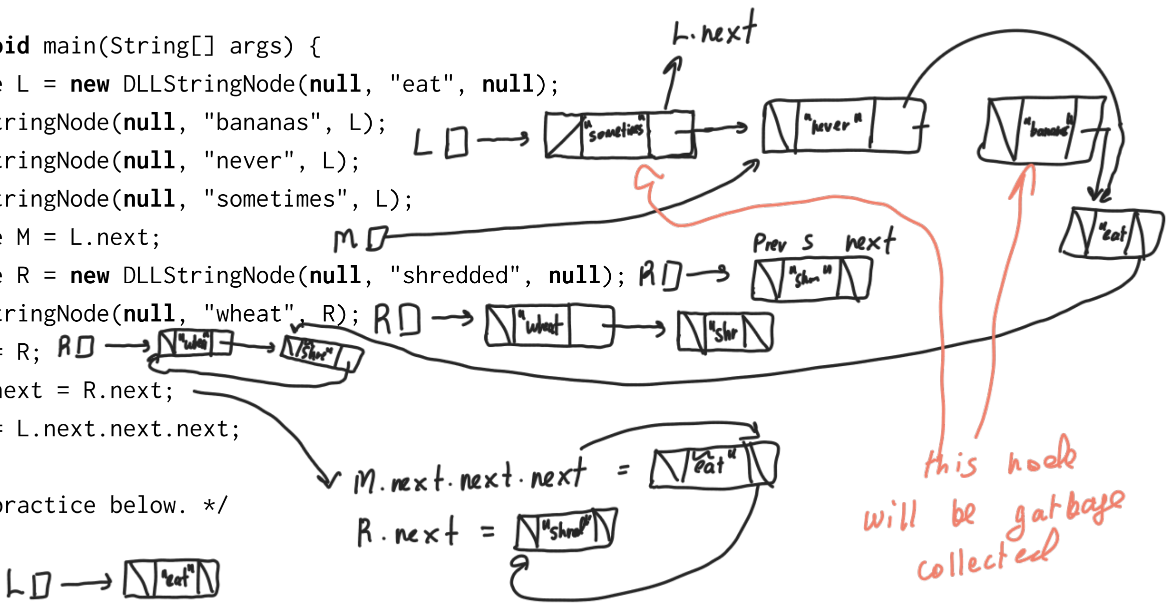
```
/** Returns a new array containing the elements of A shifted k positions to the right. */
public static int[] rotate(int[] A, int k) {

    int rightShift = k % A.length;

    if (rightShift < 0) {

        rightshift += A.length;
    }

    int[] newArr = new int[A.length];

    for (int i = 0; i < A.length; i++) {

        int newIndex = (i + rightShift) % A.length;

        newArr[newIndex] = A[i];
    }
    return newArr;
}
```

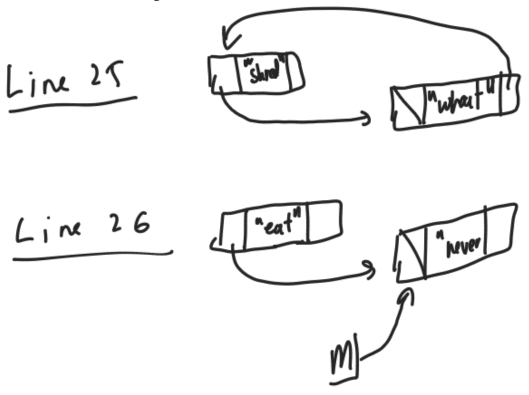


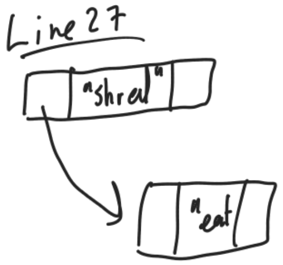
3 Cardinal Directions

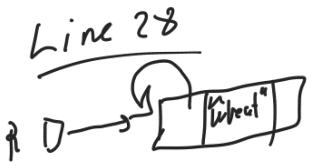
Draw the box-and-pointer diagram that results from running the following code. A `DLLStringNode` is similar to a `Node` in a `DLList`. It has 3 instance variables: `prev`, `s`, and `next`.

```
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 }
```





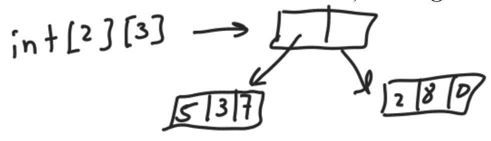




4 Gridify

(a) Consider a circular sentinel implementation of an `SLList` of `Node`s. For the first `rows * cols` `Node`s, 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.

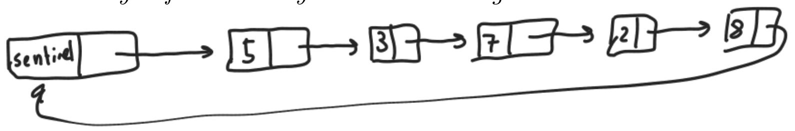
For example, if the `SLList` contains elements $5 \to 3 \to 7 \to 2 \to 8$ and `rows = 2` and `cols = 3`, calling `gridify` on it should return this grid.



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?



```
public class SLList {
    Node sentinel;

    public SLList() {
      this.sentinel = new Node();
    }

    private static class Node {
      int item;
      Node next;
    }

    public int[][] gridify(int rows, int cols) {
      int[][] grid = new int[rows][cols];
      gridifyHelper(grid, sentinel.next, 0);
      return grid;
    }

    private void gridifyHelper(int[][] grid, Node curr, int numFilled) {
      if (curr == sentinel || numFilled >= grid.length * grid[0].length) {
         return;
      }

      int row = numFilled / grid[0].length;
      int col = numFilled % grid[0].length; [0 - 2]

      grid[row][col] = curr.item;
      gradifyHelper(grid, curr.next, numFilled++);

    }
}
```

with circular SLList, we wont end up at null at the end, we get sentinel node (check drawing above).

row will be the index at which we're in a linked list, divided by num of cols we've, so "index" / grid[0].length

(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?

It will be much harder to deal with so many vars at once. if it errors especially. in this way it's much simpler and intuitive