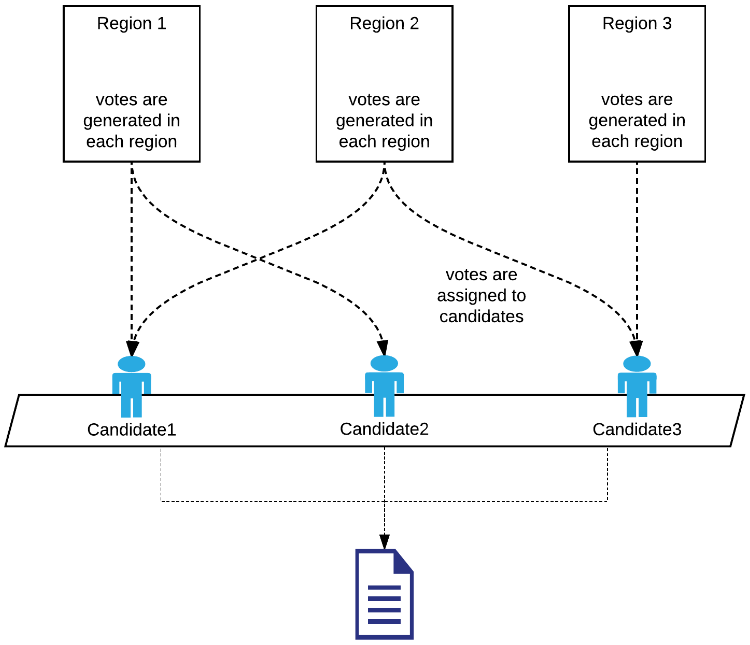
Programming Assignment #3 Election Simulation

In this Assignment, we will simulate the results of a hypothetical election. Our elections simulator will allow us to "predict" the results of a very heated elections race.

Our elections simulation consists of Regions, Candidates, and Votes

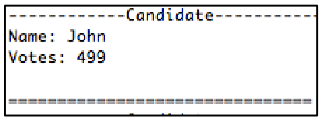

Region 1
votes are generated in each region
Region 2
votes are generated in each region
Region 3
votes are generated in each region
votes are assigned to candidates
Candidate1
Candidate2
Candidate3

1.

- Create a class named Candidate that will be used to store information about each candidate. The Candidate class will have three (3) instance variables.
    - **String name** : this is the name of the candidate.
    - **int numVotes**: this is the number of votes the candidate received.
    - **Votes[] votes**: this is an array of the votes a candidate received.

- Create a constructor that accepts **string name** and **int maxVotes**. The constructor should
    - set the name of the candidate
    - create an array of Vote. The size of the array is **maxVotes.**

- Implement **Comparable** on the Candidate class. Candidates are compared based on the **numVotes**.
- Create a **toString** method that returns a String in this form



```
------------Candidate------------
Name: John
Votes: 499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```

- Create a class named **Vote**. The Vote class is written as an inner class of the Candidate class.
    - The class has one instance variable **int regionNum**.
    - Create a constructor for the Vote class that accepts a parameter **int regionNum**.
- Create an **addVote()** method in the candidate class. This method accepts a parameter **int regionNum**. It creates a new Vote object and adds the vote to the votes array of the candidate.

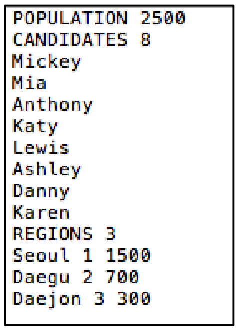
2.

- Create a class named **Region** that will be used to store information about each electoral region. The Region class is a **threaded** class. Therefore, you must implement **threading**. The Region class will have four (4) instance variables.
    - **String name :** this is the name of the region.
    - **int regionNum:** this is the number of the region.
    - **int population:** this is the population of the region.
    - **Candidate[] candidates:** this is an array of the candidates of the election.
- Create a constructor that accepts all the parameters and can create a Region object.
- Create a method **generateVotes()**. This method must do the following.
    - selects a number randomly between **0** and **number of Candidates**
    - calls the **addVote** method of the candidate object stored in the array at the random number location.
        - *{This simulates a vote from someone in that region.}*
- The Region thread should **run** the **generateVotes()** method.

3.

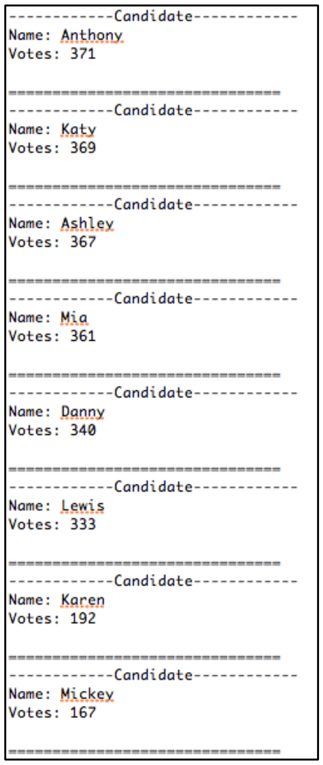
- Create a class named **ElectionSim** that will be used as the election simulator. This class must read input data from a text file, run the simulation and then write the output to another text file.
- The class has four (4) instance variables.
    - **string outputFile:** this is the path of the output file.
    - **int population**: this is the total number of votes.
    - **Candidates[] candidates**: this is the list of candidates.
    - **Region[] regions:** this is the list of regions.
- Create a **constructor** that accepts two (2) parameters
    - **String inputFile:** the path of the input file.
    - **String outputFile:** the path of the output file.
    - The body of the constructor **must** carry out the following tasks.
        - Set the outputFile instance variable
        - Read the input file and set the following
            - Set the population instance variable.
            - Create Candidate objects and add them to the **candidates** array.
            - Create Region objects and add them to the **regions** array.
- Create a method **saveData()**
    - This method must do the following
        - Sort the **candidates** array
        - Write the information in the **candidates** array to the output file.
- Create a method **runSimulation().** This method will be used to start the simulation.
    - The method should call the start method on all the regions created.
    - The method should wait until all threads end. *{use an appropriate method of the thread class}*
    - The method should then call **saveData()** to save the simulation results to the output file.

Sample Input



```
POPULATION 2500
CANDIDATES 8
Mickey
Mia
Anthony
Katy
Lewis
Ashley
Danny
Karen
REGIONS 3
Seoul 1 1500
Daegu 2 700
Daejon 3 300
```

Sample outputs



```
------------Candidate------------
Name: Anthony
Votes: 371

================================
------------Candidate------------
Name: Katy
Votes: 369

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------------Candidate------------
Name: Ashley
Votes: 367

================================
------------Candidate------------
Name: Mia
Votes: 361

================================
------------Candidate------------
Name: Danny
Votes: 340

================================
------------Candidate------------
Name: Lewis
Votes: 333

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------------Candidate------------
Name: Karen
Votes: 192

================================
------------Candidate------------
Name: Mickey
Votes: 167

================================
```

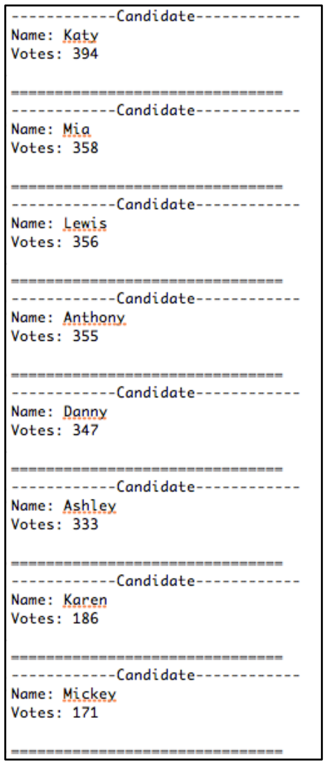

```
------------Candidate------------
Name: Katy
Votes: 394

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------------Candidate------------
Name: Mia
Votes: 358

================================
------------Candidate------------
Name: Lewis
Votes: 356

================================
------------Candidate------------
Name: Anthony
Votes: 355

================================
------------Candidate------------
Name: Danny
Votes: 347

================================
------------Candidate------------
Name: Ashley
Votes: 333

================================
------------Candidate------------
Name: Karen
Votes: 186

================================
------------Candidate------------
Name: Mickey
Votes: 171

================================
```
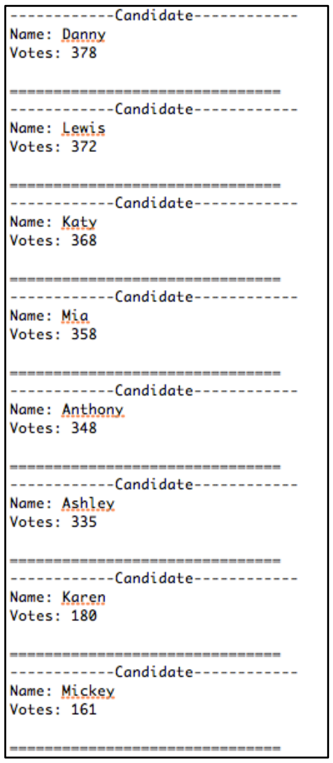
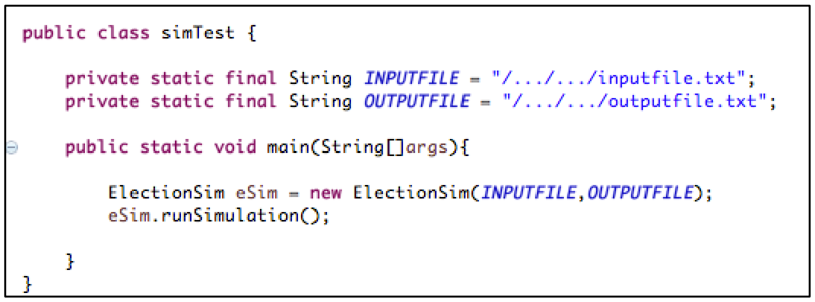



```
------------Candidate------------
Name: Danny
Votes: 378

================================
------------Candidate------------
Name: Lewis
Votes: 372

================================
------------Candidate------------
Name: Katy
Votes: 368

================================
------------Candidate------------
Name: Mia
Votes: 358

================================
------------Candidate------------
Name: Anthony
Votes: 348

================================
------------Candidate------------
Name: Ashley
Votes: 335

================================
------------Candidate------------
Name: Karen
Votes: 180

================================
------------Candidate------------
Name: Mickey
Votes: 161

================================
```

Hints:

- The **addVote()** method of the candidate class is **"critical".** This method should be *synchronized*.
- You may implement threading using **Runnable** or the **Thread** class
- Ensure the total number of votes for all candidates add up to the population
- Your inner class(es) should be private.
- This code can be used to test your work



```java
public class simTest {

    private static final String INPUTFILE = "/.../.../inputfile.txt";
    private static final String OUTPUTFILE = "/.../.../outputfile.txt";

    public static void main(String[]args){

        ElectionSim eSim = new ElectionSim(INPUTFILE,OUTPUTFILE);
        eSim.runSimulation();

    }
}
```

Submission :

You have to submit the source code **and** written documentation.

Written Documentation

In the documentation, you should include a short description of the implementation methodology as well as an explanation of what you did. **Also, you should include print screen or screen shot or snapshot of your program's output in the document.**

You may include screenshots of the output of different input values that you chose.

Online Submission

Submit your assignment's java code and document files via the **Assignment #3** on the LMS system.

Submission deadline

Your submission is due at **midnight on June 10, 2022.**

- In case you do not meet the deadline,
    - 50% of your score will be deducted for a delay within 24 hours
    - 75% of your score will be deducted for a delay within 48 hours
    - 0 points will be given for a delay of more than 48 hours.
- This is an individual assignment. **Please do not copy another student's work.**