The City College of New York
Department of Compute Science
CSc 221: Software Design Laboratory

Assignment 2 – Fall 2019

The goal of this assignment is to write a Java program consisting of multiple methods as well as the use of the secure random number generator. This assignment accounts for 10% of your final grade. Only submit your Java source file(s), and do not submit class or IDE-related files.

Note: please do your own work, sharing and/or copying code and/or solution ideas with/from others will result in a grade of 0 and disciplinary actions for all involved parties. If you run into any problems and have done your best to solve them, please see me before/after class or e-mail me.

Problem Description:

Remember to properly comment your code. Comments should precede variables, method declarations, and major steps in your code.

Write a program which simulates a race between *two* contenders. Use the Java secure random number generator class to simulate the movements of the two racers. The race will continue until there is a winner (or a tie). The race track consists of 100 squares and the first racer to reach *or pass* the final square (i.e. 100) wins the race. The course weaves its way up the side of a slippery mountain, so occasionally the contenders lose ground. A clock ticks once per second (i.e. iteration). With each tick of the clock, your program should adjust the position of the racers according to the rules shown in Figure 1. Use variables to keep track of the positions of the racers (i.e., position numbers are 1–100). Start each racer at position 1 (the "starting gate"). If the racer slips before square 1, move it back to square 1 (i.e. no negative positions).

In each iteration of the simulation, move both racers and use the *printf* method to print the positions of each racer at the end of each iteration. If both racers land on the same square during the race, print the word IT's A TIE. When there is a winner, stop the race and indicate the winner; remember to use *printf*.

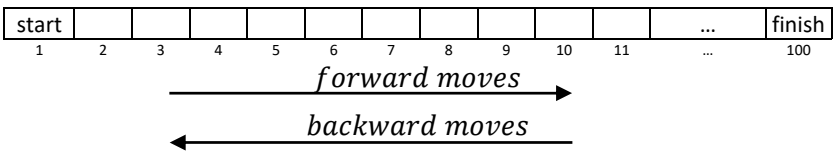
Begin the race by printing a proper message (e.g. On Your Mark, Get Set, Go)

You must include the following in your class:

- ✓ At least one use of a static member variable
- ✓ Overload the *toString()* method. The method returns the string *"Race simulation class"*.
- ✓ At least two methods in addition to *main()* and *toString()*
- ✓ At least one use of *WHILE* loop statement
- ✓ At least one use of *FOR* loop statement
- ✓ At least one use of *SWITCH* statement
- ✓ At the end of the race print the winner and the total number of iterations the program went through.

Hints:

- ✓ In order to simulate the percentages in Figure 1, generate a random integer $\mathcal{X}$ such that $1 \leq \mathcal{X} \leq 10$. A 50% is achieved if $1 \leq \mathcal{X} \leq 5$, a 20% is achieved if $6 \leq \mathcal{X} \leq 7$ …
- ✓ Each tick of the clock is a loop iteration. For example, 100 ticks on the clock are translated to 100 iterations. At the end of each iteration (tick) display the positions using *printf* as shown in Figure 2.
- ✓ Think of the 100 square runway as shown below. A right move means, advance forward, a left move means backwards. Note that you do not need an array to represent the course.



Grading:

Item	Points
Comments	10
Static member	5
WHILE loop	5
FOR loop	5
Switch	5
Loop till one wins	10
Handling of logical errors (boundary checking)	10
Two additional methods	20
printf the status at the end of every iteration	10
$main(\ \ )$	10
printf correct winner and total time elapsed	10
	100

Figures:

Racer	Move Type	Percentage of the time	Squares to move and direction
Racer #1	Jump	50%	3 Squares forwards
	Slip	30%	6 Square backwards
	Walk	20%	1 Square forward
Racer #2	Sleep	10%	No moves at all
	Jump	20%	5 Squares forwards
	Small slip	20%	2 squares backwards
	Slip	10%	10 Squares backwards
	Walk	40%	1 square forward

Figure 1: Rules for adjusting the positions of the racers.

```
On Your Mark, Get Set, Go
Time: 0
B
-----------------------------------------------------------------------------------------------------------
Time: 1
R2  R1
-----------------------------------------------------------------------------------------------------------
Time: 2
 R2    R1
-----------------------------------------------------------------------------------------------------------
Time: 3
R1 R2
-----------------------------------------------------------------------------------------------------------
Time: 4
R2R1
-----------------------------------------------------------------------------------------------------------
Time: 5
    R1R2
-----------------------------------------------------------------------------------------------------------
Time: 6
     R1R2
-----------------------------------------------------------------------------------------------------------
Time: 7
       R2R1
-----------------------------------------------------------------------------------------------------------
Time: 8
  R1     R2
-----------------------------------------------------------------------------------------------------------
Time: 9
     R1   R2
-----------------------------------------------------------------------------------------------------------
Time: 10
      R1   R2
-----------------------------------------------------------------------------------------------------------
Time: 11
         R1     R2
-----------------------------------------------------------------------------------------------------------
Time: 12
   R1 R2
-----------------------------------------------------------------------------------------------------------
Time: 13
      B
-----------------------------------------------------------------------------------------------------------
Time: 14
    R2    R1
-----------------------------------------------------------------------------------------------------------
Time: 15
  R2         R1
-----------------------------------------------------------------------------------------------------------
Time: 16
R2     R1
-----------------------------------------------------------------------------------------------------------
Time: 17
 R2       R1
-----------------------------------------------------------------------------------------------------------
Time: 18
  R2R1
-----------------------------------------------------------------------------------------------------------
Time: 19
R1  R2
-----------------------------------------------------------------------------------------------------------
Time: 20
R1   R2
```

```
Time: 574
                                                    R1                    R2
--------------------------------------------------------------------------------------------------------
Time: 575
                                                      R1                  R2
--------------------------------------------------------------------------------------------------------
Time: 576
                                                   R1                     R2
--------------------------------------------------------------------------------------------------------
Time: 577
                                                    R1            R2
--------------------------------------------------------------------------------------------------------
Time: 578
                                               R1                      R2
--------------------------------------------------------------------------------------------------------
Time: 579
                                                R1                    R2
--------------------------------------------------------------------------------------------------------
Time: 580
                                                  R1                  R2
--------------------------------------------------------------------------------------------------------
Time: 581
                                                    R1                R2
--------------------------------------------------------------------------------------------------------
Time: 582
                                                R1                      R2
--------------------------------------------------------------------------------------------------------
Time: 583
                                                  R1                    R2
--------------------------------------------------------------------------------------------------------
Time: 584
                                                    R1                    R2
--------------------------------------------------------------------------------------------------------
Time: 585
                                                R1                                R2
--------------------------------------------------------------------------------------------------------
Time: 586
                                             R1                                     R2
--------------------------------------------------------------------------------------------------------
Time: 587
                                               R1                                   R2
--------------------------------------------------------------------------------------------------------
Time: 588
                                           R1                                         R2
--------------------------------------------------------------------------------------------------------
Time: 589
                                             R1                                              R2
--------------------------------------------------------------------------------------------------------
Time: 590
                                        R1                                                   R2
--------------------------------------------------------------------------------------------------------
Time: 591
                                         R1                                                  R2
--------------------------------------------------------------------------------------------------------
Time: 592
                                           R1                                                      R2
--------------------------------------------------------------------------------------------------------
Time: 593
                                             R1
--------------------------------------------------------------------------------------------------------
Runner2 wins.
Time Elapsed = 593 seconds
```

Figure 2: Partial Sample Output Run – your results WILL differ