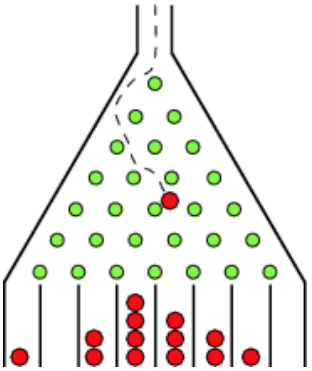
BIM306 Operating Systems
Project-I
Galton Board

Due: May 5, 2022

Project Definition

The Galton board is a device for statistical experiments named after English scientist Sir Francis Galton. It consists of an upright board with evenly spaced nails (or pegs) driven into its upper half, where the nails are arranged in staggered order, and a lower half divided into a number of evenly-spaced rectangular slots. The front of the device is covered with a glass cover to allow viewing of both nails and slots. In the middle of the upper edge, there is a funnel into which balls can be poured. The funnel is located precisely above the central nail of the second row so that each ball, if perfectly centered, would fall vertically and directly onto the uppermost point of this nail's. *Each time a ball hits one of the nails, it can bounce right (or left) with* ***equal probability***.



In the project, you asked to implement this idea using threads in Java programming language. You can consider the ball in the above figure as threads and rectangular slots as array cells.

You need to create a given number of threads if supported by your OS. Also, you need an array to count incoming threads. At any point (green circles in the figure), the thread can move either right or left. This choice is done **randomly**. When the thread finished its way, increase the value of the array cell by one. The below figure presents an example of the program output for a run. The values may naturally change for each run. Be sure that created thread count is equal to the sum of the values.

java -jar GaltonBoard.jar -numThread 1000 -numBins 20

java -jar GaltonBoard.jar -numThread 30000 -numBins 20

java -jar GaltonBoard.jar -numThread 20000 -numBins 10

Sample Outputs:

```
0       0
1       0
2       0
3       2
4       5
5       19
6       47
7       109
8       145
9       176
10      187
11      126
12      97
13      58
14      23
15      5
16      1
17      0
18      0
19      0
Number of requested thread: 1000
Sum of Bin values: 1000
Nice work! Both of them are equal
```

```
0       0
1       1
2       17
3       57
4       215
5       647
6       1558
7       2789
8       4345
9       5335
10      5255
11      4334
12      2917
13      1553
14      686
15      223
16      59
17      9
18      0
19      0
Number of requested thread: 30000
Sum of Bin values: 30000
Nice work! Both of them are equal
```

```
0       32
1       357
2       1396
3       3284
4       4928
5       4940
6       3279
7       1384
8       363
9       37
Number of requested thread: 20000
Sum of Bin values: 20000
Nice work! Both of them are equal
```