5.01 Assignment Instructions – Coin Flip

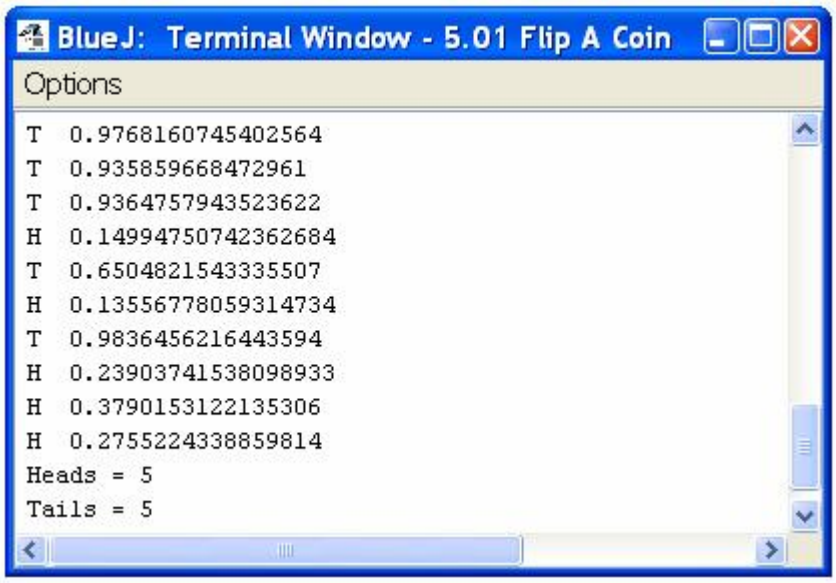
There are three separate programs to write in this assignment. Take your time and use examples in the lesson as models.

Part 1

Instructions: Write a program that simulates tossing a coin to determine the frequency of heads and tails.

1. Create a new project called 5.01 Flip A Coin in the Mod05 Assignments folder.
2. Create the HeadsOrTailsV1 class in the newly created project folder.
3. Use the **`random()`** method to simulate the outcome of flipping a coin.
4. Ask the user to enter the number of times the coin will be flipped.
5. Use the 5.01 Worksheet to record the number of heads and tails for 10, 100, 1000, and 10000 flips of a coin.
6. Calculate the average number of heads and tails for each set of trials. (Do this with a calculator, not as part of the program).
7. What happens as the number of trials increases? What do you predict for a trial of 100000 coin tosses?

Expected Output: When your program runs correctly, you should see results similar to the following screenshot.



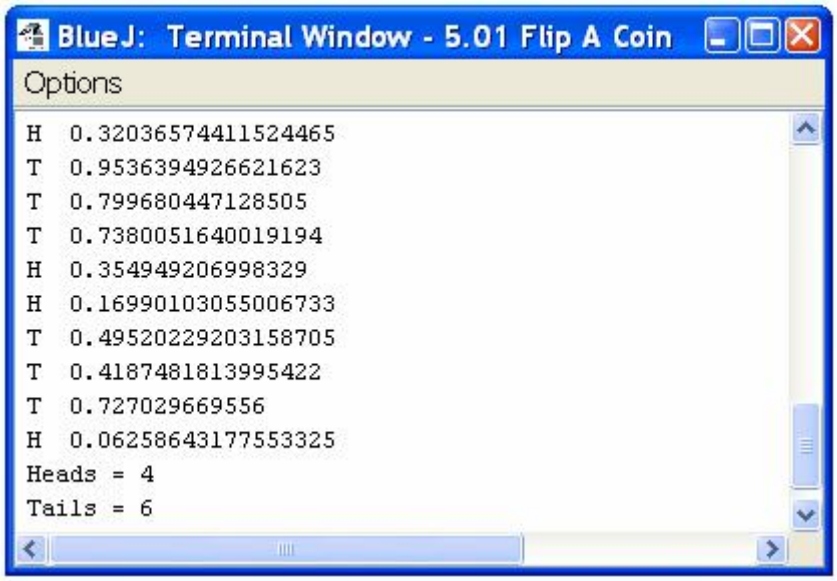
Remember that although this example shows a 50:50 ratio, other outcomes are possible.

Part 2

Instructions: Modify your coin toss program to simulate flipping a biased coin (one that does not produce a ratio of 50:50).

1. Create the HeadsOrTailsV2 class in the 5.01 Flip A Coin project in the Mod05 Assignments folder.
2. Copy your original program to the newly created class and change the name from V1 to V2.
3. Decide how biased you want the coin to be and modify the program to produce the new results. Ask the user to enter the number of times the coin will be flipped.
4. Use the second part of the 5.01 Worksheet to record the number of heads and tails for 10, 100, 1000, and 10000 flips of the biased coin. Be sure to record the Head:Tail ratio in the table.
5. Calculate the average number of heads and tails for each set of trials. (Do this with a calculator, not as part of the program).
6. Submit this worksheet with your programs for this assignment. What do you predict for a trial of 100000 coin tosses?

Expected Output: A sample of the output for a biased coin that lands on heads 40% of the time and tails 60% of the time is shown below. Your output will depend on the degree of bias you choose.



Remember that although this example shows a 40:60 ratio, other outcomes are possible.

Part 3

Instructions: Write a program to simulate the male to female ratio of a country of your choice.

1. Download the 5.01 Male to Female Population Ratios file to the Mod05 Documents folder. Print a copy for your notebook and review the method for determining the ratio of males to females in a population.
2. Use the CIA World Factbook to locate the Male:Female ratio of the country for the population you wish to simulate. Fill-in the worksheet information at the top of page 3 of the 5.01 Male to Female Population Ratios worksheet.
3. Create a new project called 5.01 Proportion of Males and Females in the Mod05 Assignments folder.
4. Create the PopulationRatio class in the newly created project folder.
5. Use an iterative control structure and the **`random()`** method to simulate determining the male to female ratio of the country you chose. You need to know the percentage of males or females in the total population. (Is this similar to Head:Tail ratios?)
6. As you run your program, record your results in the table on the bottom of page 3 of the worksheet. Simulate population sizes of 1000, 10000, and 100000.
7. Calculate the average number of males and females for each trial. (Do this with a calculator, not as part of the program). What happens as the number of trials increases?