Assignment 3 Writeup

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1 Question 1

Question: On average, how long does a game of *dreidel* with 6 players and 4 coins last? What is the longest game, and what is the shortest game?

Answer:

- When the question is asking 'how long' a game lasts, it is specifically referring to **how many rounds** does the game go on for before it ends. Since file that was written prints out how many rounds it took for the winning person to win, it can be inferred that, to find the average length of a game, we should find the average of the various rounds. So conceptually, in order to find the solution for how long a game of of dreidel lasts, we should make a **for-loop** that iterates through all of the various seeds and then store the value of the seed and the round value. Thus, in my bash script I used a for-loop that iterates through **10,000 seeds**. I am aware that it is not testing all of the seeds that the program can run, but my machine is unable to handle such a for-loop for a greater value. Additionally, the data that I get from running those seeds are still a representation of a greater data set, and can thus still be taken legitimately. I ran the **./play-dreidel command** with the flags -p 6 and -c 4 as constants but **-s has an iterator** as it's value. Then, I use the **awk command** to access the column that contains the different round values. Next, I use the **echo command** to put the iterator and the round values in the (x,y)-coordinate format. Now, we have created a file that contains all of the seeds and their associating round value. From this file, we can not only derive the average value, but also the minimum and maximum value.

- In order to get the average value, all we have to do is **iterate through the file and add up all of the round values**. Thus, in a for-loop we can iterate through the second column using the **awk** command. Inside the loop, we can increment a variable that represents the total values using the **bc** command. This is because the bc command are useful in doing basic math calculations. Then, outside of the for-loop, we can obtain the average value by using the **bc** command again in **dividing the total variable by the 10,000 values** in the file. From my bash script, my average game value is **401.64 rounds**.

- In order to get the minimum value, several unix commands must be utilized. The first one is the **awk command**, and this is needed so that we only find the minimum of the second column, which contains the round values. Then, the **sort command** is necessary so that we can use the **tail command**, which will ultimately derive the lowest value. Thus, when combining all of these commands

together, we can obtain the shortest game. From my bash script, my shortest game value is **26 rounds**.

- In order to get the maximum value, several unix commands must be utilized, and a few of them are the same ones we used for the minimum value. We must use the **awk command** to obtain the values in the second column, the **sort** command to get the values in order, and then the **head command** to find the maximum value. Thus, in using all of these unix commands, the output will be the longest game. From my bash script, my longest game value is **2539 rounds**.

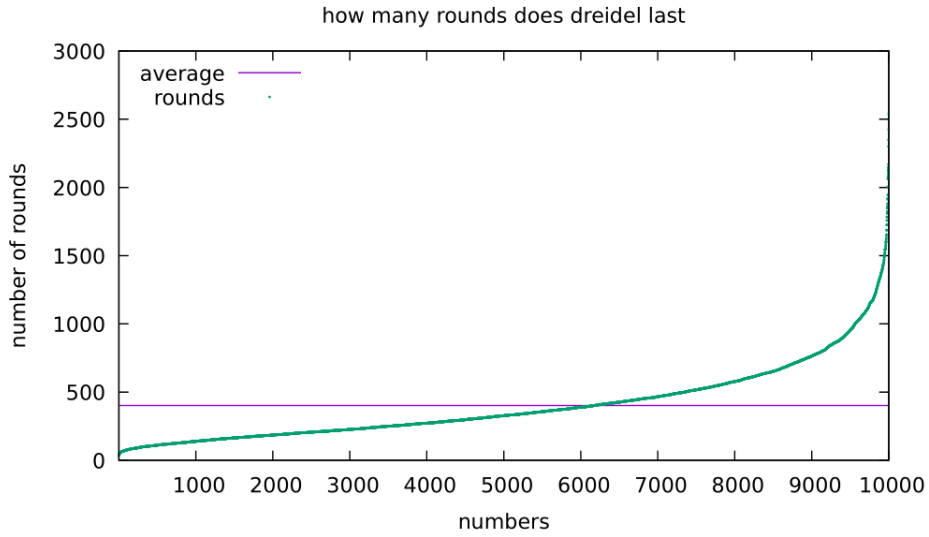

Figure 1: how many rounds each dreidel game took over 10,000 different seeds

The figure above delivers a more visual representation of the various number of rounds and how high and how low the values can be. The very **beginning** of the graph represents the **smallest value**, or the **shortest game value**. The very **end** of the graph represents the **largest** value or the **longest game value**. The line that cuts through the center of the graph represents the **average seed value**.

2 Question 2

Question: If there are more players, does the game last more rounds or fewer rounds? Experiment with 3 coins per player to test your idea.

Answer:

- The question is asking more generally, how long does the game last for with various numbers of players. Thus, a way to more accurately obtain this answer is to not only get data for how long each round lasts for with the different player options, but also how long each round lasts for with various seeds.

- In order to create this in bash, I used a **nested for-loop** with the outer loop iterating through **1,000 different seeds** and the inner for-loop iterating through the eight variations in how many people

could play the game. I am aware that iterating through 1,000 seeds is not testing all of the possibilities the program can run, but the data that I get from running those seeds are still a representation of a greater data set, and can thus still be taken legitimately. Inside of the for-loop, will be the calling of the **./play-dreidel command** with -p and -s having **different iterators** as values and add them to a separate file. Then, I use the **awk command** to only obtain the column which contains all of the game round values. I lastly use the **echo command** to add the seed value and round game value to a separate file which will be analyzed to answer the question with **gnuplot**.

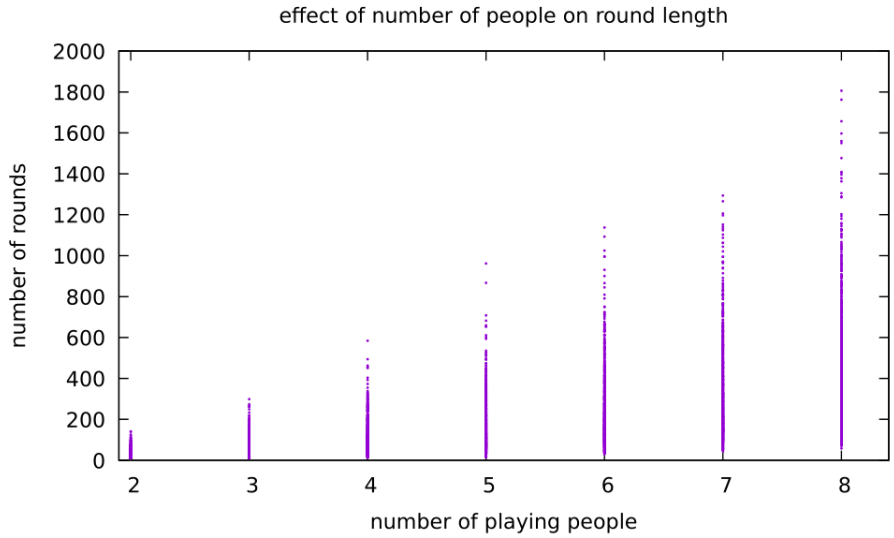

Figure 2: the number of rounds each dreidel game took with varying player counts and seeds

The figure above gives a very clear representation of how the number of playing people affects the length in rounds. As the number of people playing increase, the length in rounds also directly increase. This is also true for various seeds since the shape created by the graph is an upwards trend, which further supports the conclusion that more people playing the game increase the dreidel game time. Thus, we can conclude that,if there are **more players**, the game **lasts for more rounds**.

3 Question 3

Question: Is there an advantage (or disadvantage) to position in a round? In other words, are players in a particular position more likely to win or lose a game?
Answer:

- Another way to approach this question is to ask the question of if being a certain player (since the players are sorted alphabetically) means that you win more or less dreidel games.

- In order to obtain the answer, we must iterate through another **for-loop** which goes through **10,000 different seed possibilities**. This is so that we can get data from a varied data set. I am aware that iterating through 10,000 seeds is not testing all of the possibilities the program can run, but the data that I get from running those seeds are still a representation of a greater data set, and can thus

still be taken legitimately. Then, I call the **./play-dreidel command** which iterates through these **10,000 seeds** and moves the output to a separate file. Next, I use the unix command **awk** to only obtain the first column, which contains the names of all of the players who won. After the for-loop, I can sort the names alphabetically using the **sort -d command**, then find how many times each name was printed on the file using the **uniq -c command**, and finally using the **awk command** again to switch the order so that the frequency goes in the first column and the names go in the second. This final file will be plotted using **gnuplot**.

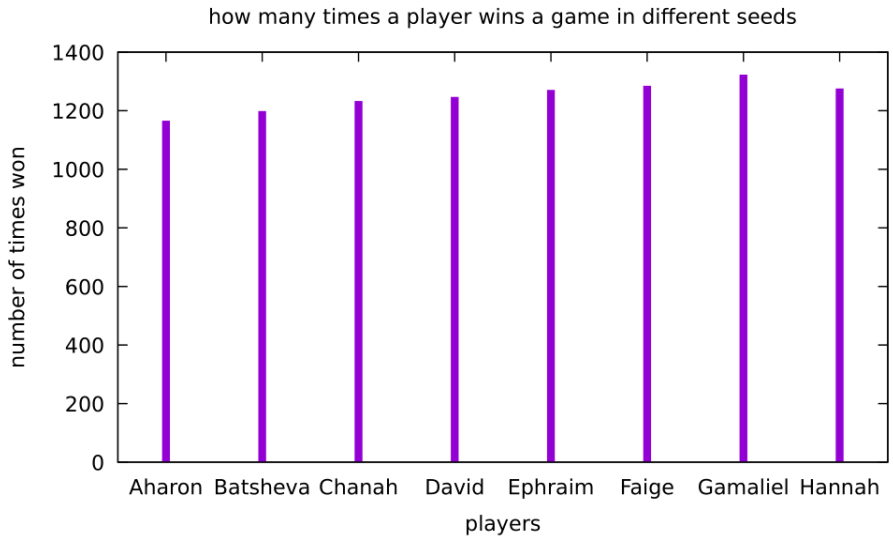

Figure 3: how many times each player won a game of dreidel given that only four players were present and changing the random seed value

As the graph depicts, there is no significant change between the number of times a player was the winner for. Even though there is some slight variation, that can be attributed to how only 10,000 seeds were tested, and not a significantly higher value. There is a slight upward trend which could imply that the further back a player is in each round of dreidel, they would have a higher advantage, but the difference is so slight that a bigger data set could equalize the chances. Thus, it can be concluded that **no**, there is **not a significant advantage nor disadvantage** to playing dreidel in a certain position.