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Unit 4
Assignment 2

A2.1

Game 1: **Player 1 wins**
Game 2: **Player 2 wins**
Game 3 (very long game): **Player 2 wins**

A2 Problem 2

Analysis of StrangeCardGame:
In 100,000 games:
Average rounds per game: 40
Games requiring at least 100 rounds: 2878
Draws: 887
Player 1's victories: 50973
Player 2's victories: 47931

The last question asks whether the game is fair. Multiple runs with 100_000 games have shown that the distribution of victories is approximately 50/50. However, in all my experiments, Player 1 always ends up with a few more victories than Player 2. Based on this, I conclude that the game is not completely fair.

A2 Problem 5: Database

A. What is a database (in a few sentences)? Explain in lay terms. A database is a collection of information (or data) structured in certain ways. Unlike other methods of storing data, such as a spreadsheet or a vertical list, databases store large or very large amounts of information. Users can employ special tools for retrieving, managing, and updating information from a database. Such tools include special programming languages, such as SQL (Structured Query Language). There are different kinds of databases, including relational, object-oriented, noSQL (non-relational), and others.

B. Find a lay person explanation a relational database (with tables) and explain what the term *join* means. A relational database stores information in the form of tables the data in which can be connected based on a common identifier. For example, a library database can include a table can containing journal id's and their URLs and titles, and another table containing the same id's and the costs of subscription. Thus either all or some of the data from

these two two tables can be combined into one table based on the journal id's. In SQL, such combining is referred to as "JOINing." According to the Data School website, "A JOIN is a [*sic*] SQL instruction in the FROM clause of your query that is used to identify the tables you are querying and how they should be combined" (https://dataschool.com/how-to-teach-people-sql/sql-join-types-explained-visually/).

C. What are the ACID properties and what do they mean? According to sources, ACID is an acronym that stands for "atomicity, consistency, isolation, and durability." These are properties of a database transaction (operation). They ensure the integrity, predictability, and accuracy of the data. **Atomicity** describes the principle of "all or nothing" in performing an operation on a database: either all commands in an SQL block are performed or none. **Consistency** ensures that data remains the same before and after the operation. **Isolation** conceals (and thus protects) transactions from each other, thus ensuring their integrity during their running. **Durability** describes the durable nature of the changes that data undergo as the result of transactions.

Sources:

ACID Properties by Henrique Siebert Domareski
https://henriquesd.medium.com/acid-properties-43e146b21e0d#:~:text=ACID%20is%20a%20concept%20(and%20an%20acronym)%20that%20refers%20to,%2C%20Consistency%2C%20Isolation%20and%20Durability.

IBM "ACID Properties of Transactions":
https://www.ibm.com/docs/en/cics-ts/5.4?topic=processing-acid-properties-transactions

D. Who uses databases and why? Many organizations use databases. Libraries use databases to store and manage innumerable publication records; they also provide library users with powerful search tools to do library research. Medical and legal offices use databases to store and retrieve information about patients and clients. Stores, especially e-stores such as amazon, use databases to manage and advertise merchandise and to enable customers to find and purchase necessary items quickly, conveniently, and securely. Air companies use databases to store, manage, and present information about flights. Finally, government agencies have for a long time used databases for collecting, storing, and using information about the state of the nation (to wit the origin of the word "statistics," information about the state); now that we are approaching April 18, the deadline for submitting tax returns, the IRS database is very much on our mind.