Project 2_3: California SuperLotto+ ROI Study

Objective

Use Monte Carlo simulation to determine whether there is any scenario in which buying a large number of (or all possible) California SuperLotto+ tickets could yield a positive return on investment (ROI). Explore the lottery's expected value under different jackpot conditions and analyze the risk involved.

Background

The California SuperLotto+ is a multi-tier lottery with large jackpots and long odds. In each draw, players select 5 numbers from 1–47 and 1 "Mega" number from 1–27. The probability of winning the jackpot is about 1 in 41 million. By simulating outcomes across many ticket purchases and using historical payout structures, this project aims to estimate the expected value per ticket and assess under what (if any) circumstances the lottery could offer a positive expected return.

85 / 15 Rule

Following the instructions laid out here is 85% of the assignment. You must add something significant to the project. In other words, if you did everything in these instructions perfectly but nothing else, the highest grade you can receive for the project is 85%.

Simulation Rules

One play = 5 unique numbers (1 – 47) + 1 Mega (1 – 27)
Total combinations = ${}_{47}C_5 * {}_{27}C_1 \approx 41{,}416{,}353$

Jackpots start at $7 million and rarely exceed $30 million
Payout Tiers

Player Draw	Prize	Probability of splitting the prize
5+Mega	Jackpot * 1.0	0.000000024
5	Jackpot * 0.0005	0.000000628
4+Mega	Jackpot * 0.00005	0.000005070
4	Jackpot * 0.000003	0.000131832
3+Mega	$48	0
3	$8	0
2+Mega	$10	0
1+Mega	$2	0
Mega	$1	0

Must simulate real-world factors like:

- Payout tiers
- Prize splitting (multiple winners)
- Federal/state taxes ~35%

Implementation

Simulate large batches of ticket purchases using real draw probabilities.
Estimate total expected payout per batch size (1 ticket to ~41.4 million).
Factor in the odds of multiple winners (shared jackpot) and taxation.

Analysis

Calculate expected Return on investment:
ROI = (Winnings / Cost of tickets) − 1
Is there a jackpot size with a positive ROI?
Plot ROI vs. jackpot size and number of tickets bought.
What is the probability that the various ticket batch sizes you simulated will earn a positive ROI?

Reporting

State all assumptions used (jackpot size, taxes, ticket pool size, etc.).
When (if ever) is the lottery a good investment?
How do real-world factors (e.g., taxes, prize sharing) impact ROI?
What assumptions are you making—and how sensitive are your results to them?

Submit

Python/Java/other simulation code
Screenshots or video of the simulation (optional)
Written report (1–2 pages)
Oral presentation (7 minutes + 3 minutes Q&A)