THE CHALLENGE

Marcus and his friends are organizing a weekly poker night with a $20 buy-in. After hearing about a friend who "won big" at the casino last weekend, some members want to raise the stakes. Marcus has been learning about probability in school and wants to make sure everyone understands what they're getting into. He needs to calculate the expected outcomes and explain why gambling is best viewed as entertainment with a cost, not as a way to make money.

How can understanding probability and expected value help you make more informed decisions about gambling activities?

Learning Objectives

- Calculate probability in various gambling scenarios.
- Distinguish between independent and dependent events.
- Explain the concept of house edge and how it ensures profits for operators.
- Calculate expected value to determine potential financial outcomes.
- Recognize the gambler's fallacy and other common misconceptions.

CORE CONCEPTS

Term	Definition
Probability	The likelihood of a specific event occurring, expressed as a number between 0 and 1 (or 0% to 100%).
Independent Events	Events where the outcome of one does not influence the outcome of another (e.g., coin flips).
Dependent Events	Events where the outcome of one affects the probability of the next (e.g., card draws without replacement).
House Edge	The mathematical advantage a game has over players, ensuring profit for the operator.
Expected Value	The average amount a player can expect to win or lose over time per bet.
Gambler's Fallacy	The mistaken belief that past events influence future outcomes in independent events.

Background: Gambling involves risking money on uncertain outcomes. The mathematics behind gambling—probability, house edge, and expected value—show that most gambling activities result in losses for players over time. Understanding these concepts helps you view gambling realistically: as entertainment with a cost, not as a way to make money. The house edge ensures operators profit in the long run, and common fallacies lead people to make irrational decisions.

APPLY IT

PART A: PROBABILITY CALCULATIONS

Calculate the probability for each gambling scenario using the formula: Probability = Favorable outcomes / Total outcomes

Scenario	Favorable Outcomes	Total Outcomes	Probability (Decimal)	Probability (%)
Rolling a 6 on a die	1	6		
Drawing an ace from a deck	4	52		
Landing on red (American roulette)	18	38		
Flipping heads twice in a row	1	4		

1. Why is it important to distinguish between independent events (like roulette spins) and dependent events (like drawing cards without replacement)?

PART B: EXPECTED VALUE ANALYSIS

Calculate the expected value for each gambling scenario using: EV = (P(win) x Amount won) - (P(lose) x Amount lost)

Scenario: Roulette Bet on Red ($10 bet)

In American roulette, there are 38 spaces (18 red, 18 black, 2 green). A winning bet pays even money ($10 wins $10).

Show your calculation:

Expected Value per $10 bet: ____________________

2. If you placed 100 bets of $10 each on red, what would be your expected total loss?

Calculation:

Expected total loss: $____________

Hint: *Expected Value formula: EV = (18/38 x $10) - (20/38 x $10). The negative result shows the house advantage.*

PART C: HOUSE EDGE COMPARISON

Compare the house edge across different gambling activities to understand which games cost players the most.

Game	House Edge	Expected Loss per $100 Bet
Blackjack (basic strategy)	0.5%	
American Roulette	5.26%	
Slot Machines (average)	8%	
State Lottery	50%	

3. If someone gambled $500 per month on slot machines (8% house edge), what would their expected annual loss be?

CHECK YOUR UNDERSTANDING

1. What is the gambler's fallacy?

- ☐ A. Believing that a game has no house edge
- ☐ B. Believing that past independent events affect future outcomes
- ☐ C. Believing that skill can overcome all random games
- ☐ D. Believing that the house always loses

2. In roulette, the ball has landed on black 8 times in a row. What is the probability it will land on red next?

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3. Calculation: A lottery ticket costs $2 and has a 1 in 10,000,000 chance of winning $5,000,000. What is the expected value of the ticket?

Show your work:

Expected Value: $____________

4. Why does a negative expected value mean "the house always wins" in the long run?

5. Reflection: How does viewing gambling as "paid entertainment" rather than a "money-making opportunity" help someone make better financial decisions?