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Artificial Intelligence

Lab 6

Slot Machine Probability Summary

When Calculating the probability of winning given 10 coins and the win conditions of:  
BAR/BAR/BAR = 20 coins

BELL/BELL/BELL = 15 coins

LEMON/LEMON/LEMON = 5 coins

CHERRY/CHERRY/CHERRY = 3 coins

CHERRY/CHERRY/not CHERRY = 2 coins

CHERRY/not CHERRY/not CHERRY = 1 coin

The total probability of winning came out to be a 25% chance. This was calculated with the formula:

Total probable outcomes = 4^3 = 64

The number of win states = 16

The number of win states / total probable outcomes = 25%

It can also be calculated by going into each win state and calculating the probability of a win and adding them all up to get the total probability of a win.

Ex. Cherry win chance: 20.3125%

Cherry, Not Cherry, Not Cherry = ¼ \* ¾ \* ¾ = .140625

Cherry, Cherry, Not Cherry = ¼ \* ¼ \* ¾ = .046875

Cherry, Cherry, Cherry = ¼ \* ¼ \* ¼ = 0.015625

0.140625 + 0.046875 + 0.015625 = 0.203125 = 20.3125%

When this formula is used for all the symbols with the Lemon, Bell, and Bar win chances all equalling 0.015625. Adding all probabilities of winning adds up to .25 which is 25%

To calculate the expected payout i used the formula:

Win\_chance \* (payout\_amount / currency\_value)  
With every win chance being a 1.5625% chance.

I used this formula for every win outcome and added them together to get the expected payoff return which came out to be 0.90625with the win conditions and currency to play being 1 coin.

When I implemented a Simulation of playing the game over and over again with ten coins, I used a Simulation size of 100, and during each simulation period I kept track of the number of total spins, wins, and coins won. At the end of the last simulation I output the combined results where I calculate total wins, spins, coins won, median win amount, win percentage, and median spin amount. To calculate the Mean win rate / win chance, it was done by total wins / total spins which gave me a percentage win very close to the actual win chance. This is the output:

Number of starting coins: 10

Number of possible outcomes: 64

Number of win states: 16

Probability of win: 25.0% chance

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CHERRY:

Fractional Chance: 0.203125

LEMON:

Fractional Chance: 0.015625

BELL:

Fractional Chance: 0.015625

BAR:

Fractional Chance: 0.015625

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Expected Payoff Return: 1.609375

Total Simulations: 100

Total Wins: 1753

Total Spins: 6911

Total Coins Won: 5911

Mean win amount: 0.25365359571697293

Median win amount: 3

Median spin amount: 14

Given a higher sample size, the Mean win amount will get closer and closer to the probability chance of winning.