Probabilities in the Game Monopoly

Park Place. Mario Beauregard/age fotostock/Getty Images

By Courtney Taylor
Updated January 26, 2019

Monopoly is a board game in which players get to put capitalism into action. Players buy and sell properties and charge each other rent. Although there are social and strategic portions of the game, players move their pieces around the board by rolling two standard six-sided dice. Since this controls how the players move, there is also an aspect of probability to the game. By only knowing a few facts, we can calculate how likely it is to land on certain spaces during the first two turns at the beginning of the game.

The Dice

following sums are possible:

A sum of two has probability 1/36.

A sum of three has probability 2/36.

A sum of four has probability 3/36.

A sum of five has probability 4/36.

A sum of six has probability 5/36.

A sum of seven has probability 6/36.

A sum of eight has probability 5/36.

A sum of nine has probability 4/36.

A sum of ten has probability 3/36.

A sum of eleven has probability 2/36.

A sum of twelve has probability 1/36.

These probabilities will be very important as we continue.

The Monopoly Gameboard

We also need to take note of the Monopoly gameboard. There are a total of 40 spaces around the gameboard, with 28 of these properties, railroads, or utilities that can be purchased. Six spaces involve drawing a card from the Chance or Community Chest piles. Three spaces are free spaces in which nothing happens. Two spaces involving paying taxes: either income tax or luxury tax. One space sends the player to jail.

We will only consider the first two turns of a game of Monopoly. In the course of these turns, the furthest we could get around the board is to roll twelve twice and move a total of 24 spaces. So we will only examine the first 24 spaces on the board. In order these spaces are:

1. Mediterranean Avenue
2. Community Chest
3. Baltic Avenue
4. Income Tax
5. Reading Railroad

8. Vermont Avenue
9. Connecticut Tax
10. Just Visiting Jail
11. St. James Place
12. Electric Company
13. States Avenue
14. Virginia Avenue
15. Pennsylvania Railroad
16. St. James Place
17. Community Chest
18. Tennessee Avenue
19. New York Avenue
20. Free Parking
21. Kentucky Avenue
22. Chance
23. Indiana Avenue
24. Illinois Avenue

First Turn

The first turn is relatively straightforward. Since we have probabilities for rolling two dice, we simply match these up with the appropriate squares. For instance, the second space is a Community Chest square and there is a 1/36 probability of rolling a sum of two. Thus there is a 1/36 probability of landing on Community Chest on the first turn.

Below are the probabilities of landing on the following spaces on the first turn:

Community Chest – 1/36

Baltic Avenue – 2/36

Income Tax – 3/36

Reading Railroad – 4/36

Vermont Avenue – 5/36

Connecticut Tax – 4/36

Just Visiting Jail – 3/36

St. James Place – 2/36

Electric Company – 1/36

Second Turn

Calculating the probabilities for the second turn is somewhat more difficult. We can roll a total of two on both turns and go a minimum of four spaces, or a total of 12 on both turns and go a maximum of 24 spaces. Any spaces between four and 24 can also be reached. But these can be done in different ways. For example, we could move a total of seven spaces by moving any of the following combinations:

Two spaces on the first turn and five spaces on the second turn

Three spaces on the first turn and four spaces on the second turn

Four spaces on the first turn and three spaces on the second turn

Five spaces on the first turn and two spaces on the second turn

We must consider all of these possibilities when calculating probabilities. Each turn's throws are independent of the next turn's throw. So we do not need to worry about conditional probability, but just need to multiply each of the probabilities:

The probability of rolling a two and then a five is (1/36) x (4/36) = 4/1296.

The probability of rolling a three and then a four is (2/36) x (3/36) = 6/1296.

The probability of rolling a four and then a three is (3/36) x (2/36) = 6/1296.

The probability of rolling a five and then a two is (4/36) x (1/36) = 4/1296.

Mutually Exclusive Addition Rule

Other probabilities for two turns are calculated in the same way. For each case, we just need to figure out all of the possible ways to obtain a total sum corresponding to that square of the game board. Below are the probabilities (rounded to the nearest hundredth of a percent) of landing on the following spaces on the first turn:

Oriental Avenue – 0.77%

Chance – 1.54%

Vermont Avenue – 2.70%

Connecticut Tax – 4.32%

Just Visiting Jail – 6.17%

St. James Place – 8.02%

Electric Company – 9.65%

States Avenue – 10.80%

Virginia Avenue – 11.27%

Pennsylvania Railroad – 10.80%

St. James Place – 9.65%

Community Chest – 8.02%

Tennessee Avenue 6.17%

New York Avenue 4.32%

Free Parking – 2.70%

Kentucky Avenue – 1.54%

Chance – 0.77%

Indiana Avenue – 0.31%

Illinois Avenue – 0.08%

More Than Three Turns

For more turns, the situation becomes even more difficult. One reason is that in the rules of the game if we roll doubles three times in a row we go to jail. This rule will affect our probabilities in ways that we didn't have to previously consider. In addition to this rule, there are effects from the chance and community chest cards that we are not considering. Some of these cards direct players to skip over spaces and go directly to particular spaces.

Due to the increased computational complexity, it becomes easier to calculate probabilities for more than just a few turns by using Monte Carlo methods. Computers can simulate

Probability & Games

How to Calculate Backgammon Probabilities

Probability & Games

Probabilities for Rolling Three Dice

Probability & Games

Probabilities for Rolling Two Dice

Probability & Games

Probability Distribution in Statistics

Probability & Games

Probability of Going to Jail in Monopoly

Probability & Games

The Probability of Rolling a Yahtzee

Math

Bell Curve and Normal Distribution Definition

Probability & Games

What Is Conditional Probability?

Probability & Games

Probability of a Small Straight in Yahtzee in a Single Roll

Probability & Games

Expected Value for Chuck-a-Luck

Formulas

Probability of the Union of 3 or More Sets

Probability & Games

The Probability of a Full House in Yahtzee in a Single Roll

Probability & Games

Probabilities and Liar's Dice

Probability & Games

The Meaning of Mutually Exclusive in Statistics

Probability & Games

The Probability of a Large Straight in Yahtzee in a Single Roll

Arithmetic

Games for Memorizing Times Tables