Games People Play

Casinos rely on the laws of probability and expected values of random variables to guarantee them profits on a daily basis. Some individuals will walk away very wealthy, while others will leave with nothing but memories. This lab is designed to allow you to analyze some of the games of chance that are typically played in casinos. *(Subliminal message: keep your money in your pocket!)*

# STATION 1: Rolling Dice

Roll two dice and note the sum.

* *If sum = 7 or 11 on your first roll, then you win!*
* *If sum = 2, 3, or 12 on your first roll, then you lose.*
* *If any other sum is rolled, write down the number you got. This is your “magic number.”* *Roll again and again until either:*

 *You get your “magic number” again, in which case you win!*

or

 *You roll a 7 before getting your “magic number” again, in which case you lose.*

1. Play a total of 20 games of craps. Record your results below.

|  |  |  |
| --- | --- | --- |
| **Game** | **1st Roll** | **Result (W/L)** |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |   |
| 6 |  |  |
| 7 |  |  |
| 8 |  |  |
| 9 |  |  |
| 10 |  |  |
| **Game** | **1st Roll** | **Result(W/L)** |
| 11 |  |  |
| 12 |  |  |
| 13 |  |  |
| 14 |  |  |
| 15 |  |  |
| 16 |  |  |
| 17 |  |  |
| 18 |  |  |
| 19 |  |  |
| 20 |  |  |

In what proportion of the games did you win on your first roll?

In what proportion of the games did you win?

Probability Questions for Rolling Dice

1. Now write down the theoretical probability of each sum occurring. *(Hint: Make the chart if it helps you!)*

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Possible Sum | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Theoretical Relative Frequency |  |  |  |  |  |  |  |  |  |  |  |

1. One of the ways you can win at craps is to roll a 7 or 11 on your first roll. With your first roll, determine

 P(7 or 11).

1. One of the ways you can lose at craps is to roll a sum of 2, 3, or 12 on your first roll. With your first roll, determine P(2, 3, or 12).
2. a) Find the theoretical probability of winning on the first roll in craps.
	1. Write down the theoretical probability of losing on the first roll in craps.
	2. Find the theoretical probability of rolling again after the first roll in craps.

STATION 2: BLACKJACK

The game of blackjack begins by dealing 2 cards to a player, the first face-down and the second face-up on top of the first. The player has a "blackjack" if he has a black jack and an ace as his two cards. The player has "twenty-one" if he has an ace and a 10, Jack, Queen, or King.

1. Deal 10 blackjack hands, one at a time, shuffling between each hand. That is, deal 2 cards, then check the result, then shuffle, then deal two more cards, etc. Record the number of blackjacks and "twentyones" you obtain:

Blackjacks: \_\_\_\_\_\_\_\_\_ Twenty-one: \_\_\_\_\_\_\_\_\_\_ Neither: \_\_\_\_\_\_\_\_\_

2. Given that the face-up card is an ace, find the probability that you have:

 a. a blackjack b. twenty-one

3. Given that the face-up card is a black jack, find the probability that you have:

 a. a blackjack b. twenty-one

4. Are the events A = face-up card is a black jack and B = 2nd card drawn results in a “black jack” independent? Justify your answer!

STATION 3: COINS, DICE, CARDS, TREES

In this game, you begin by tossing 4 coins simultaneously. You count the number of tails. If this number is even, then you draw a card from the deck. If the number is odd, then you roll a pair of dice.

1. Play this game 10 times and record your results. The outcome on the dice is the sum of the two numbers obtained, whereas the card outcome is the denomination – ace, king, two, etc. that you draw.

|  |  |  |  |
| --- | --- | --- | --- |
| Trial | Coin toss - #H | Outcome on dice/card | W/L???(total) |
|  1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |
| 6 |  |  |  |
| 7 |  |  |  |
| 8 |  |  |  |
| 9 |  |  |  |
| 10 |  |  |  |

2. Create a tree diagram for this game. Include all probabilities on each branch of the tree diagram.

 (on a separate sheet of paper)

3. List the sample space for tossing 4 coins.

4. What is the probability of getting an even number of tails? An odd number?

5. Find the probability of obtaining a sum of 10 on the dice after tossing.

1. Find the probability of obtaining a 10 from the deck of cards after tossing.

7. Find the probability of winning this game all together.