Let's do some math….with Blackjack!

Blackjack is essentially a card game between two people, the player and the dealer. (There may be other players at the table, but each player is only playing against the dealer.) To win, a players hand must have a value closer to 21 than the dealers hand, without going over 21.

Simplified Rules of Blackjack

There is a dealer and from one to seven players at a table.

1. A deck of cards is shuffled and cut (several decks of cards may be used). The dealer deals two cards to each player and two cards to himself one face up and one face down.

2. Each player in turn may request one or more additional cards, with the goal of attaining a total value as close to 21 as possible without going over. A player immediately loses if he or she goes over 21.

3. When all players are satisfied with their current totals, the dealer may take additional cards according to the following rules: the dealer must hit (take another card) if the current total is 16 or less, and the dealer must stand (not take another card) if the current total is 17 or more.

4. Any player with a total greater than the dealers total wins. If the dealer goes over 21, all players with a total of 21 or less win.

Finding the Probability of Being Dealt a Blackjack.

The term blackjack means that you get a value of 21 with only two cards (an ace and a card with that is worth 10). What is the probability of being dealt a blackjack with the first two cards of a single deck of cards?

1. First, explore the experimental probability of being dealt a blackjack with the first two cards.

   (a) Simulate this problem with a deck of cards. Shuffle the cards and deal the top two cards from the deck. Check to see if they form a blackjack. Replace the cards in the deck and shuffle. Again, deal the top two cards and check to see if they form a blackjack. Repeat this 50 times. Then find the experimental probability of being dealt a blackjack with the first two cards of a single deck.

2. Now find the theoretical probability of being dealt a blackjack with the first two cards.

   (a) When you are dealt two cards, the order of the cards matters because only one card faces up for example, the hands Q, 8 and 8, Q are different. How many different pairs of cards can you be dealt? (Hint: Think of the number choices for

the first and second cards.)

(b) If a pair is a blackjack, then you were either dealt an ace followed by a 10, J, Q, or K, or a 10, J, Q, or K followed by an ace. How many different 6 blackjack pairs are there? (Remember, there are four cards of each of the 13 denominations in the deck.)

(c) What is the theoretical probability of being dealt a blackjack?

3. In some blackjack games, several decks of cards are used. Do you think the probability of being dealt a blackjack on the first two cards will increase, de- crease, or stay the same if more than one deck of cards is used? Answer the following questions to find out.

a) Combine 2 decks of cards. Again, perform 50 trials in each case. What is the experimental probability?

b) Calculate the theoretical probability of being dealt a blackjack using both two and three decks of cards.

c) Were the probabilities of being dealt a blackjack from 1, 2, and 3 decks of cards what you expected?