Taking the Luck out of Chance, and Replacing it with - Math!!

Script

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Hi my name is Arthur and today I want to talk to you about the game blackjack also known as 21; and in particular the math behind the strategy known as card counting. Card counting is a strategy used by professional and amateur blackjack players in order to increase their chances of winning.

In casinos, you will find blackjack tables with different minimum bets ranging from $3 to $100. You choose your table and place your bet as do the other players at your table. Cards are alternately dealt to the players around the table, from the dealer's left to right, until each player and the dealer have 2 cards. Tables using a 'dealer's shoe'- a box-like device used to hold 6-8 decks of cards, have the cards dealt face-up; except for the dealer who keeps one 'in the hole' or face-down. In single deck games the players' cards are dealt face-down.

In blackjack, the object of the game is to have a hand closer to the value of 21, than that of the dealer, without going over. If you get 21 with your first 2 cards, this is called **blackjack** or a **natural**. A table using a 'shoe' pays 3 to 2 for a blackjack on a $10 bet giving you $15 whereas, in single deck games the payout is 6 to 5, giving you $12 for your $10 bet. If the dealer also has blackjack, it is a tie or 'push' in which case you neither win nor lose. For all intensive purposes, I will use the multiple deck shoe model for this discussion. There is a basic rule of play in blackjack that the dealer must follow which is that, he or she must draw cards until his hand is equal to or greater than 17. Also, depending on the casino, a dealer will either 'hit' meaning to draw a card, or 'stand' with a **soft 17**. A soft 17 is when the dealer has a value of 17 made up of an Ace, valued as 11, plus his other cards such as 4 and 2, totaling to 17. These rules prohibit the dealer from making any decisions on his own.

The 'house edge' is a statistical advantage for the casino which is built into the game. The advantage of the dealer's position is in the playing order of blackjack relative to the player. The dealer plays last, therefore, the fact is that if the player busts, the player loses, regardless of whether the dealer subsequently busts. The average blackjack player, using basic strategy will lose less than **1%** of their total wagered amount with strictly average luck; this is very favourable to the player compared to other casino games. However, the loss rate of players who deviate from the basic strategy through ignorance is in general expected to be greater. The basic strategy involves your decision to hit or stand based on your cards, and the dealer's up-card or visible card. The strategy also involves when to **split** a pair of cards if possible, and when to **double down** your bet. There are too many outcomes to discuss here, however a chart is available online, or can be provided to you at most casinos. There is also what is called an **insurance bet**. When the dealer's up card is an Ace, the player has the option to bet up to half the original bet, that the dealer's hole card is not a K, Q, J or 10. The payout on such a bet is 2 to1 if the dealer has blackjack. In general it is not recommended that a player makes this bet. Even if you have blackjack you will simply break even.

At this point I would like to move on to the process of card counting. Card counting was developed back in the early 60's by an MIT math professor named Edward Oakley Thorp. He was a pioneer in modern applications of probability theory based on the **Kelly Criterion**, which he learned about from the 1956 paper by scientist John Larry Kelly, Jr. **In general**, if the gambler has zero edge, then the criterion will usually recommend the gambler bets nothing or very low. On the other hand, when a player is known to have an edge over the house, he should bet accordingly; the greater the edge, the greater the bet. Card counting is what will help give you this edge.

High cards – tens, Jacks, Queens, Kings and Aces – are good for the player and low cards – 2, 3, 4, 5 and 6 are bad for the player. By keeping a ratio of good cards to bad cards the player can make an assessment of whether the cards still to be played will benefit or hurt him. There are a number of methods used for counting cards, some simpler than others. The simpler the system the less efficient or accurate the assessment will be. I will look at the **HI/LO** method which is one of the more commonly used methods, and ranks somewhere in the middle for playing efficiency. There is no need to memorize played cards, instead what you do is assign the cards values and then keep a '**running'** count. After the shuffle, you start the count at zero and then assign the following card values: **2-6 (the low cards) → +1, 7-9 → 0, and cards 10, J, Q, K and A (the high cards) → -1**. If the running count is greater than zero, there are more high cards left to play, and therefore better for the player. **Therefore the greater the plus number, the better it is for the player.**

This '**running**' count must be converted into a **'true'** count to be effective for betting and playing decisions. We do this by dividing the running count by the amount of decks left unseen in the shoe. For example in a four deck shoe, a **running** count of **+4** and two decks left to play, the **true** count would be **+2**. With single decks, the true count is obtained by multiplying the running count by the inversed fraction of remaining cards. For example a running count of **+4**, and ¾ of the deck remains, we multiply **+4** by **4/3** giving us **16over3** which equals an advantage of **+5.33** for the player. With single decks, the true count is always higher than the running count.

While card counting is not illegal in the casinos, provided it is done in your head, most casinos hate to lose their edge and tend to frown on its use. Casinos get suspicious of players by observing the player's betting habits and comparing it to that of a Kelly

criterion. And since most casinos are private property they have the right to ban you from their property; and any future visits could see you charged for trespassing.

With our basic strategy learned, our proficiency in card counting, and our betting strategy down, we are ready to go out and have some fun. Making sure not to win or lose too much.

Let us try some exercises with card counting.

1)
With the running count starting at 0, what is our resulting running count?
Is this count good or bad for the player?

Player 1: **A, 10**
Player 2: **3, 7**
Player 3: **8, 9**
Player 4: **5, 9**
Player 5: **4, 6**
Dealer   : **10**

2)
What is the true count in a 4 deck shoe with 2 decks played, including the following cards?

Current running count: +2
Player 1: **5, 10, 1, 3**
Player 2: **3, 7, 5, J**
Player 3: **8, 9**
Player 4: **5, 9, 2, K**
Player 5: **4, 6, A**
Dealer   : **7**

3)
With a running count of -3, and 2/3 of a single deck game seen, what is the true count for the remaining deck?
Is this a favourable situation for the player, and how should he bet?

Resources

http://wizardofodds.com/blackjack

http://en.wikipedia.org/wiki/Blackjack

http://www.blackjackinfo.com/blackjack-rules.php

http://en.wikipedia.org/wiki/Edward_O._Thorp

http://en.wikipedia.org/wiki/Kelly_criterion

http://www.onlineblackjackodds.com/blackjack/card-counting/system-hi-lo/

http://www.homepokergames.com/cardcounting.php