

Dr. Chun's Numb3rs & Løgic

Card Counting



Young H. Chun, Ph.D.

*Professor of Decision Science &
Cherie H. Flores Endowed Chair in MBA Studies*

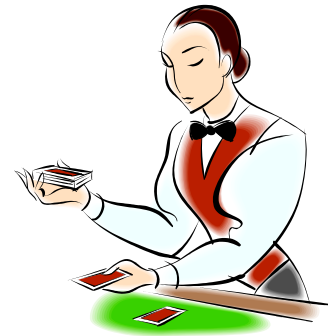
MIT Blackjack Team

ABC News (Sept. 15, 2003)



Through the years, a group of math students at MIT has focused their considerable brain power on a very extracurricular activity: **gambling** — specifically **blackjack**. The team used a method known as "**card-counting**", which helps players predict when the cards being dealt will be **favorable** to them.

By knowing which cards have been spent and which ones remain in the shoe, savvy players can keep a running "count" which works as a **rough predictor** of how many **high cards** are left. **High cards** work to a **player's** benefit because they boost the odds that they will beat the **dealer**.



Card counting allows players to bet more with less **risk** when the count gives an advantage as well as minimize **losses** during an unfavorable count.

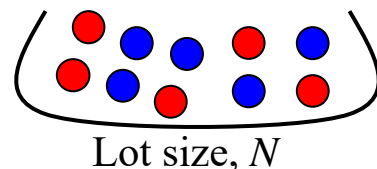
Card Counting



Card counting is a casino card game strategy used primarily in the **blackjack** family of casino games to determine whether the **next hand** is likely to give a probable advantage to the **player** or to the **dealer**.



* **Sampling** (from a **finite** population **without** replacement!)

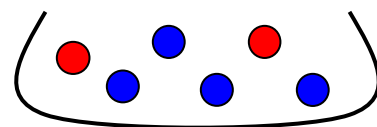


Lot size, N



Sample size, n

$$P[\text{Blue}] = 5/10$$



Lot size, N



Sample size, n

$$P[\text{Blue}] = \boxed{4/6}$$

4 blue balls
2 red balls



* Assumptions

- High cards benefit the player more than the dealer.
- Low cards help the dealer, while hurting the player.

* Hypothesis

- H_0 : The table is "cold"
(i.e., there are more low cards in the remaining shoe.)
- H_1 : The table is "hot"
(i.e., there are more high cards in the remaining shoe.)

* Procedure

- You don't need to keep track of every card.
- Instead, assign a point score to each card you see, and then track only the sum of these values.
(This is called keeping a "running count.")





* High and low cards

	Low	Neutral	High
▪ Card value	2, 3, 4, 5, 6	7, 8, 9	10, J, Q, K, A
▪ Point score, x_i	+1	0	-1

* Test statistic at stage k :

- Running count, $S_k = \sum_{i=1}^k x_i$



▪ Example

Stage, k	1	2	3	4	5	6	7	8	9	10	11
Card value	4	7	A	9	Q	2	4	6	4	A	5
Point score, x_k	1	0	-1	0	-1	1	1	1	1	-1	1
Running count, S_k	1	1	0	0	-1	0	1	2	3	2	3

* Decision rule

- If $S_k > d$, conclude H_1 that the table is hot.
where d is a pre-specified decision value.



* Legal issue

Card-counting is not **illegal** and is not considered **cheating**. But casinos, being **private establishments**, can eject and ban anyone they feel is a threat to their bankroll — whether they're cheating **illegally** or counting cards **legally**.



* Strategy

- A number of **card counters**, called "**spotters**", are dispatched to tables around a casino.
- **Spotters** do not change their bet size or strategy in order to avoid detection by the casino.
- A **spotter** gives a secret signal to a "**big player**" when the table is **hot**.
- The **big player** then joins the game at that table, placing **maximum bets** at a **player's advantage**.

LSU Blackjack Team in Action



* MBA Field trip to the Casino this **Friday!**

Low risk, high return **guaranteed!**



Be sure to wear your **running shoes** just in case!

Movie Trivia



It is based on the true story about six **MIT students** who were trained to become experts in **card counting** and subsequently took **Vegas casinos** for millions in winnings.

21 (2008)



It is based on the true story about six **MIT students** who were trained to become experts in **card counting** and subsequently took **Vegas casinos** for millions in winnings.