A PROF BEATS THE GAMBLERS

by Edward O. Thorp

The advantage in two-handed blackjack, long supposed to lie with the dealer or the house, was converted recently to the profit of the player by Edward O. Thorp, *a young assistant professor in the mathematics department of New Mexico State University. A detailed exposition of his theory for winning at blackjack will be published in book form next fall by Blaisdell.*

Gamblers have learned through experience that games of chance can be run in such a way that a certain percentage favors one side at the expense of the other side. That is, if the game is played a sufficient number of times, the winnings of the favored side are generally near a certain fixed percentage of the total amount of all bets placed by the opponent. The modern gambling casino takes the side of the gambling games which has proved in practice to be favorable. If necessary, the casino alters the rules of the game so that the casino advantage is sufficient to cover expenses and yield a desirable rate of profit on the capital which the owners have invested.

There have been many attempts to overcome the casino advantage. But all of them have the same flaw. The casino always sets a limit to the amount that may be bet. With this limit on bets, the casino wins the same percentage of the gross bets which it normally wins, even though a player uses a complicated betting scheme. It was no surprise, then, when it was proved, by using the mathematical theory of probability, that for *most* of the standard gambling games no betting scheme can ever be devised that will have the slightest effect upon the casino's long-run advantage. In view of this mathematical proof and the painful experience of millions of gamblers, informed people and uninformed people alike firmly believe that it is impossible to beat any of the modern casino gambling games.

I was well acquainted with these facts, and therefore I did not harbor the belief that gambling in the casinos was a likely way to make money. I was, however, a frequent visitor in Nevada. One Christmastime during school vacation, just before my wife and I left U.C.L.A. to spend a few days in Las Vegas, a professor called my attention to an article in one of the mathematics journals. The article described a strategy for playing blackjack which assertedly limited the house to the tiny edge of .62 percent. This allows the player an almost even break, so I made up a little card with the strategy on it and brought it along on our trip.

As played in the casinos, blackjack, or twenty-one, involves a dealer employed by the casino and one to six players. After players make their bets, hands of two cards each (hole cards) are dealt to each of the players and to the dealer. The players in turn, and then the dealer, are allowed to draw additional cards. The goal is a total as close to twenty-one as possible without exceeding it. The dealer's strategy is fixed: he must draw to (hit) totals of sixteen or less and may not draw to totals of seventeen or more. Players can draw or not, as they please. They also have the option of doubling down with their hole cards — that is, they can double their bet and draw exactly one more card.

The numerical value of cards is ten for all tens and face cards; it is as labeled for cards two through nine, and aces may be counted as either one or eleven, as desired. A pair of hole cards with the same numerical value may be split, to form two hands. An additional bet equal to the original one must be placed on the new hand.

Bets are usually paid off at even money. If the player's total exceeds the dealer's, he

Beating the Dealer

The omnicompetent computer, whose attention often seems to be concentrated on the welfare of moon travelers and submariners, may at last have produced a palpable boon for the common run of mankind: a system for winning money in a gambling house.

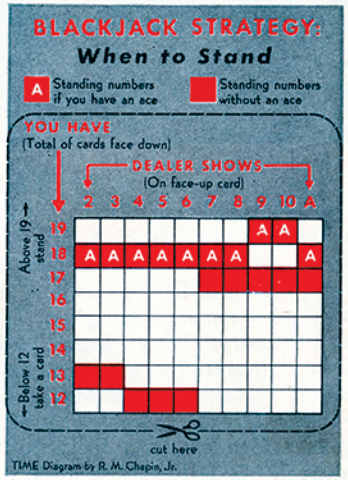
A 30-year-old mathematics professor named Edward O. Thorp claims to have made this important breakthrough by feeding the equivalent of 10,000 man-years of desk-calculator computations into an IBM 704 computer and arriving at a set of discoveries about the way the odds fluctuate in the game of blackjack, or twenty-one. This system enables the initiate to bet heavily when the odds are with him, lightly when they are against him. What's more, the cost of the system —including a set of palm-sized, sweat-resistant charts to take to the casino—is only $4.95, which happens to be the cost of Thorp's book, *Beat the Dealer* (Blaisdell).

Hard Hands & Soft. Thorp's system is based on the fact that blackjack is not what mathematicians call an "independent trials process," in which, as in craps or roulette, each play is uninfluenced by the preceding plays. As each card is played in blackjack, it changes the possibilities for both player and dealer by diminishing the number and the variety of cards that may be dealt.

Hence the basic blackjack strategy, according to Thorp's computer, is that the fewer cards valued at two to eight that are left in the pack, the greater advantage to the player. On the other hand a shortage of nines, tens and aces gives the dealer an advantage. A scarcity of fives, Thorp's figures indicate, is more advantageous to the player than a shortage of any other card; when all four fives have been played, the player has an edge of 3.29% or, as expressed roughly in odds, 52-48 in the player's favor. Thorp has devised a series of charts to show when to split a pair ("always split aces and eights, never split fives and tens"),* when to double and when to stand.

Knowing when to stand and when to ask for another card is, of course, the heart of the game. Thorp's chart for this differentiates between what he calls "soft" hands—hands that contain an ace and are therefore less likely to go over 21 (aces count as either 1 or 11)—and "hard" hands, which contain no ace. For example, when the dealer is showing a nine or ten, a soft hand should draw, even on 19, because the ace in it can be taken as 1 if necessary (reducing the 19 to 9), whereas in the same circumstances a hard hand should stand at 17. And when the dealer shows a four, five or six, a hard hand should stand at 12 (because with a four, five or six in his hand the dealer runs a considerable risk of going bust), whereas a soft hand is advised to draw another card up to 18.

This is Thorp's basic strategy; his full-dress system involves a much more complex technique of betting in terms of the number of tens, aces and fives remaining in the deck in relation to the number of cards left in the pack before the next shuffle.



The Small Martingale. Professional gamblers generally take Mathematician Thorp and his computerized charts with a sneer and a leer; system players, they say, are always ultimate losers because they play on and on, giving the house odds a chance to operate. The only successful system, known as the Small Martingale, is to double the bet after each losing play, a maneuver the casinos effectively counter by establishing a bet limit. With a limit of $500, a doubler starting at $1 would have to bet an illegal $512 after only nine consecutive losses.

Thorp claims, however, that in Reno and Las Vegas the casino operators took him very seriously indeed after the system began to click. The dealer's most effective stratagem is to shuffle between each hand. This destroys Thorp's carefully arrived at calculations, but the operators use it only as a last resort because it slows down the play at the table and hence the overall profit.

* Aces should always be split because there is a good chance of a winning hand with either of the new hands; eights should be split if the dealer has a seven or higher showing simply because 16 is such a bad total to hold; splitting five is unfavorable because it replaces a good total to draw to; splitting tens throws away an excellent hand (20) for two that are only a little better than average.