MATHEMATICS

Your Chances at Betting

Gambling can be discussed as a matter of mathematics, but professional gambling does not offer as good odds as mathematical chances.

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➤ LIFE is a gamble. Every time we make a choice or a decision, we gamble. Even marriage is a lottery.

Betting is just one phase of gambling. In the matter of morality, mathematics is perfectly neutral. Gambling can be discussed purely as a matter of numbers.

Some of the greatest mathematicians, like the Frenchmen, Pascal and Fermat, calculated the chances of the gaming-table. Out of their discussions were born the great branches of mathematics: probability, statistics, theory of combinations and actuarial science.

Probability is vital to life insurance, the study of heredity, prediction of the weather and a thousand other activities.

When the odds in gambling are mathematically correct, the favorable and unfavorable chances are perfectly equal. In professional gambling, however, the market odds fall short of the correct odds, and your chances of winning are not so good.

Some Money Lost

From an alleged perpetual-motion machine we get less energy than we put in because some of it is dissipated in friction and heat. So from professional gambling we receive less money on the average than we bet because some of it is dissipated in the maintenance of gambling quarters, material and personnel.

The thrill of gambling is a commodity that must be paid for. The difference between the market odds and the correct mathematical odds determines its average cost.

In professional gambling the house usually withdraws the following percentages of the total money bet, redistributing the rest among the gamblers:

Roulette (French type, single zero)	3%
Roulette (American type, double zero)	5%
Chuck-a-luck	8%
Sporting events with odds of 5 to 6 on either side	8%
Horse races	15%
Slot machines	at least 25%
Numbers racket—a gross swindle	50%

The house takes its percentage of the money you bet as well as the money you win. This is more than the house percentage of your winnings alone and has the effect of shortening the correct odds by more than the house percentage. The smaller the correct odds, the sharper the cut. Thus if the house percentage is 10 per cent and the correct odds are 1 to 1, the odds become only 4 to 5, a drop of 20 per cent.

An illusion prevails that a betting system increases one's chances in gambling. In the popular system of doubling up, where you risk a dollar on an even bet like the toss of a coin and double the bet after each loss until you win—if ever—there always remains a small chance of losing a large sum. As the chance becomes smaller, the possible loss increases. This risk always exactly compensates for your near-certainty of winning $1.

The superstitious faith in the magic of a betting system is founded on a misconception of the basic law of chance. If the number of heads in a series of throws really tended to equal the number of tails, then each past tail thrown would have to increase the chance of a future head. But it is not the total number of heads tossed that tends to equal that of tails, but the percentage of tosses that tends to be equal.

Consider the case of a man who, in tossing a coin, gets heads the first 20 throws, then heads and tails alternately thereafter. If he tosses the coin only 20 times, only heads turn up. If he tosses 40 times, his score is 75 per cent heads and 25 per cent tails. But when he tosses the coin 1,000 times, only 51 per cent of his throws show heads and 49 per cent tails, or a fairly equal number of each.

Long Series Improbable

A series of 20 heads would be very rare. Yet when it comes both in theory and in practice, it will be followed as often as not by another head. A coin has no memory of how it fell on previous throws.

An exceedingly long series of heads would be so improbable as to establish an imperfection in the coin. This would persuade an observant person to bet not on tails but on another head. Similarly a number that has turned up often at Monte Carlo is perhaps a better bet than one that has not. There is no future compensation for the latter, while repetition

TAKING CHANCES—Large amounts are lost and won in gambling houses such as the one shown in the motion picture, "Lady Luck."

of a number suggests a possible bias in the wheel.

Other, more complicated betting systems than doubling up are based on the principle of increasing one's bet less than 100 per cent after a loss and diminishing it after a win. In this way more money is usually staked on winning bets. There is even a curious system in which two partners make opposite bets in roulette, the net effect being the difference of their bets on each play.

Systems Do Not Work

But none of these systems works. Every system carries a small chance of a great loss, and the smaller the chance, the greater loss. It will fail just often enough and cost just enough to cancel all its gains.

No mere combination or arrangement of bets can disturb the balance of favorable and unfavorable chances for each bet. No mathematical jugglery can cancel one iota of the total risk. You can only rearrange the hazards, concentrate or distribute them, but not change their sum.

Some gamblers feel it should be mathematically possible to distribute bets in a horse race so as to win, or at least break even, no matter which horse wins. Market odds make this impossible.

Consider a race between two horses, All Ahead and Blue Bell, the first of which would win twice as often as the second. Knowledge of their relative performances would result in twice as much money being bet on the first as on the second.

Correct Odds

The correct odds would be 2 to 1 on Blue Bell and .50 to 1.00 on All Ahead. If the track percentage were 15 per cent, the odds would become 1.55 to 1.00 on Blue Bell and only .55 to 2.00 on All Ahead.

When the odds are correct, you would break even if you bet $2 on All Ahead all of the time, winning two-thirds of the time, or if you bet $1 on Blue Bell, winning one-third of the time. But by such betting at the above track odds, you would lose 15 per cent of the total amount bet.

If you have $3 to bet on a race, you will break even regardless of the result if, when the odds are correct, you bet $2 on All Ahead and $1 on Blue Bell. But at the above track odds, this system, which represents the best possible hedging, will always result in the loss of 15 per cent of the total amount you bet.

TURF BETTING—Odds 20% lower than correct mathematical odds are usually offered by the race track.

Every gambler feels that though his system may fail for any given number of bets, it is bound to succeed eventually if he only plays it long enough. But to survive a long chain of possible losses requires an almost inexhaustible fortune.

A person with $99 gambling fairly against with $1 will win the $1 a total of 99 times out of 100, but the hundredth time he will lose his whole $99. The small chance of a great loss inevitably recurs and restores the perfect symmetry between favorable and unfavorable chances.

In professional gambling, the greater fortune generally belongs to the bank. The inveterate gambler who is never content with moderate gains or losses is in effect pitting his limited wealth against the relatively limitless resources of the gambling bank, or even of society at large. Here his near-certainty of losing is counterbalanced by the fabulous fortune which he has one chance in millions of winning.

On rare exceptions the odds might even favor the bettor. The odds on a fight, for instance, might be 6 to 5 at one place and 5 to 6 at another because of the way the fans of the two fighters are placing their bets. Then by betting $5 against $6 at each place, you are bound to win $1.

Bettors who maintain such inconsistent odds are putting you in the position of the gambling bank. Collectively they are giving money away, and there is no mathematical argument against taking such money if you are ever lucky enough to find it. But these odds could not be maintained long in an open market without bankruptcy. In general, market odds fall substantially short of the correct odds.

Similarly, if the odds on the same event are first 6 to 5, and then 5 to 6, by betting $5 against $6 at each time, you are bound to win $1. But you are still flirting with chance. In making the first bet, you were making in addition a concealed bet that the odds would change in your favor, a bet which you might have lost.

In any gambling, the odds are slightly against the bettor because the money he may gain by an even bet has a slightly smaller value to him than that which he may lose. This difference in value is negligible for small variations in his fortune, but may become ruinous for large sums.

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Hybrid varieties of *popcorn* are popular because they expand about one-fourth more than ordinary popcorn in popping.