Expected value is the mathematical average payoff of a bet, calculated across all the outcomes that could happen. It is the baseline for casino math: it tells you what a wager is worth on average before you place it, not what you should expect to win on one particular spin, hand, or roll.

The calculation is straightforward once you list the possible outcomes, assign each one a probability, and multiply each probability by its payoff. The tricky part is being precise about what "payoff" means. Are you counting the money you win, your original stake, or your net result after the bet settles? A clear definition prevents common mistakes.

The expected value formula

For a bet with several possible outcomes, the expected value formula is:



Expected value = Σ (probability of an outcome × payoff for that outcome)

The symbol Σ means "add them all up." In plain language, calculate the probability-weighted payoff for every possible result, then total those amounts. This is a **weighted average payoff**: outcomes that are more likely have more influence on the average than outcomes that are rare.

For a simple win-or-lose bet, the formula can be written as:

EV = (probability of winning × net win) + (probability of losing × net loss)

Use net results if you want to know how much your bankroll changes. A winning $10 bet that pays even money has a net win of $10: you receive your stake back as well as $10 in winnings, but the stake itself is not profit. A losing $10 bet has a net result of −$10.

A worked example: betting on red in European roulette

European roulette has 37 pockets: 18 red, 18 black, and one green zero. Suppose you stake $10 on red. Ignoring any special promotions, there are two relevant outcomes for your bet:

- If the ball lands on red, you win $10 in profit. The probability is 18/37.

- If it lands on black or zero, you lose your $10 stake. The probability is 19/37.

Now apply the formula:

EV = (18/37 × $10) + (19/37 × −$10)

EV = $180/37 − $190/37 = −$10/37 ≈ −$0.27

The expected net result is about **−27 cents per $10 bet**. That does not mean the casino takes 27 cents from you every time. On any single spin, you either win $10 or lose $10. The 27-cent figure is the average net result per bet over a very large number of comparable bets, under the same rules.

Net payoff and gross payout are not the same

Casino games often describe payouts in ways that include the original stake. That is useful for understanding how much cash is returned, but it can cause confusion when calculating expected value.

In the roulette example, a winning $10 red bet returns $20 in total: your $10 stake plus $10 profit. A losing bet returns $0. If you calculate the expected *gross return*, you get:

Expected gross return = (18/37 × $20) + (19/37 × $0) ≈ $9.73

You staked $10, so the expected net result is $9.73 − $10, or about −$0.27. Both calculations quantifiedstrategies.com are valid; they answer different questions. Gross return includes the stake coming back. Net expected value measures the change in your bankroll.

Before using an advertised payout, check whether it is described as “to one,” “including the stake,” or in some other format. Convert it into either a net payoff or a gross return, and stick with that convention throughout the calculation.

How probabilities and outcomes fit together

A reliable calculation starts with a complete list of outcomes for the specific bet. Each outcome needs a probability and a payoff. The probabilities should add up to 1, or 100%, if the list includes every possible result.

Outcome Probability Net payoff on a $10 stake Probability × payoff Win 18/37 +$10 +$180/37 Lose 19/37 −$10 −$190/37 Total expected net value 1 −$10/37 ≈ −$0.27

Some bets have more than two outcomes. A wager might win different amounts depending on the result, return the stake on a push, or pay a bonus for a rare combination. Include every relevant outcome, including outcomes with a zero net payoff. If you leave out a possible result or use the wrong probability, the final answer will be wrong even if the arithmetic is perfect.

A three-outcome example

Imagine a fictional bet with a 10% chance to win $50 net, a 30% chance to win $5 net, and a 60% chance to lose $5. Its expected value is:

EV = (0.10 × $50) + (0.30 × $5) + (0.60 × −$5) = $3.50

The expected net value is +$3.50 per play. Notice that the 10% outcome matters, but it does not get treated as if it were guaranteed. Its large payoff is weighted by its low probability.

RTP and house edge: two ways to describe the average

Return to player (RTP) is generally expressed as the percentage of total stakes a game is expected to return over a large number of plays. The **house edge** is the casino's corresponding mathematical advantage, expressed as a percentage of the stake. In a simple game with no unusual adjustments:

House edge = 100% − RTP

For the European roulette red bet, the expected gross return is about $9.73 for each $10 staked. That is an RTP of about 97.30%. The difference, about 2.70%, is the house edge. In dollar terms, that is the same roughly 27-cent expected loss calculated above.

RTP is a long-run statistic, not a promise about an individual player's results or a short session. It is also important to check what an RTP figure refers to: a particular game, a specific bet, or a set of game rules. Different bets in the same game can have different probabilities and payouts, so their expected values may differ.

Expected value is a long-run average, not a prediction

Expected value does not say what will happen on the next bet. It describes the average result you would approach if the same wager were repeated many times under the same conditions. In probability, this is the distinction between a theoretical average and an actual sample of results.

For example, the roulette calculation says the average net result is about −$0.27 per $10 bet. After 10 bets, the expected total loss is about $2.70. But a real 10-bet session could end ahead, down much more than $2.70, or somewhere in between. The expected figure is not a minimum, maximum, or schedule of losses.

If bets are independent and have the same expected value, their expected values add. So for 100 identical $10 red bets, the expected net result is about 100 × −$0.27, or −$27. That still does not mean the actual result will be exactly −$27. It is the average across many hypothetical sets of 100 bets.

Why variance and volatility make sessions feel random

Expected value describes the center of the long-run average. **Variance** and **volatility** describe how widely individual outcomes can spread around that average. Two bets can have the same expected value but feel very different because one produces small, frequent changes while the other produces rare, dramatic swings.

Consider two hypothetical bets, each with an expected value of zero. One pays $1 with certainty. Another has an equal chance of winning $100 or losing $100. Both average to zero, but their short-term experiences are very different. The second has much greater volatility: a short run can land far from its average.

In roulette, the $10 red bet has a limited set of outcomes, but those outcomes are large relative to its expected loss. A string of wins can make a session look profitable, while a run of losses can create a much larger loss than the average would suggest for that number of spins. Random sequences often contain streaks; a streak by itself does not show that the underlying probability has changed.



This is why a casino session can feel unpredictable even when the game's odds are known. Expected value answers, "What is the average payoff across repetitions?" Variance answers a different question: "How much might results bounce around that average?" Neither one tells you the exact outcome of your next bet.

A practical step-by-step checklist

1. **Define the bet.** Write down the stake, game rules, and the exact wager you are evaluating.
2. **List all possible outcomes.** Include wins, losses, pushes, partial returns, and special payouts.
3. **Assign probabilities.** Use the correct rules and make sure the probabilities total 100%.
4. **Choose a payoff convention.** For bankroll impact, use net results after accounting for the stake.
5. **Multiply and add.** For each outcome, multiply its probability by its payoff, then sum the results.
6. **Check the units.** State whether the answer is dollars per bet, a percentage of the stake, or a gross return.
7. **Interpret it correctly.** Treat the result as a long-run average, not a forecast for one play or one session.

Common calculation mistakes

- **Counting the stake as profit.** A returned stake is not the same as winnings. Separate gross payout from net payoff.
- **Ignoring a possible outcome.** Pushes, zeros, and bonus outcomes can materially change the calculation.
- **Mixing percentage and dollar figures.** A house edge is usually a percentage of the stake; expected value in dollars depends on the stake size.
- **Reading RTP as a personal guarantee.** RTP describes an expected long-run return under specified conditions, not what one player will receive in a session.
- **Assuming a positive EV guarantees a win.** Even a favorable expected value can produce losses in the short run, and a negative-EV bet can win on a particular play.

The takeaway

To calculate expected value for a single bet, multiply each possible payoff by its probability and add the results. Use net payoffs if you want to measure the change to your bankroll. The answer is a weighted average payoff: a useful baseline for comparing bets and understanding RTP and house edge, but not a prediction of what will happen next.

Probability sets the average; variance shapes the ride. Keeping those ideas separate makes casino math easier to interpret—and helps explain why a game with known odds can still feel completely random from one session to the next.