

Bing

Sure, here's a simplified introduction with examples for each point in the summary:

1. **Elements of Probability:** Probability theory is a branch of mathematics that deals with uncertainty. It provides a way of quantifying uncertainty and axiomatically builds a mathematical model of uncertainty. For example, if we roll a fair six-sided die, the sample space is $\{1, 2, 3, 4, 5, 6\}$, and the probability of each outcome (event) is $1/6$.
2. **Random Variables:** A random variable can be thought of as a variable whose value is subject to variations due to chance (i.e., randomness, in a mathematical sense). For example, if we flip a coin, we might define the random variable X to be 0 if we get tails and 1 if we get heads.
3. **Expectation and Variance:** The expectation (or average) of a random variable is a measure of the “center” of the distribution. The variance is a measure of the “spread” of the distribution. For example, if we roll a fair six-sided die, the expectation of the outcome is 3.5 and the variance is approximately 2.92.
4. **Some Common Random Variables:** There are many types of random variables that commonly appear in applications. For example, a Bernoulli random variable represents a single trial that can result in either “success” (with probability p) or “failure” (with probability $1-p$). A normal (or Gaussian) random variable has a bell-shaped distribution and is determined by its mean (μ) and variance (σ^2).
5. **Multiple Random Variables:** Often, we are interested in experiments that involve more than one random variable. For example, if we flip two coins, we might be interested in the number of heads (one random variable) and whether the two outcomes are the same (another random variable).
6. **Random Vectors:** A random vector is simply a list (or vector) of random variables. For example, if we roll three dice, we might represent the outcome as a random vector (X_1, X_2, X_3) , where X_i is the outcome of the i -th die.

I hope this helps! Let me know if you have any other questions.