

Chapter 15	Chances, Probability, and Odds: Measuring Uncertainty.
Section 4	What Is a Probability?

Probability measures a desired outcome against all outcomes.

In a multi-stage random experiment, a specific outcome is desired. When an experiment is conducted repeatedly (multiple trials), the outcomes are recorded. Each outcome either matches the desired outcome or it does not. The number of times the actual outcome matches the desired outcome, compared to the total number of outcomes (trials) is the probability of the desired outcome.

For example, the book talks about a fair coin. With a fair coin, the heads or the tails has an equal chance of appearing. Because the chances are equal, you would expect a head half the time.

Another example would be a fair, six-sided die. Each side has an equal chance of appearing. Because the chances are equal, you would expect a particular number, say 5, to appear  $1/6^{\text{th}}$  of the time.

In the previous two examples, we can estimate the probability of a given outcome without conducting multiple trials because each outcome is equally likely.

Not all multi-stage random experiments have outcomes that are equally likely. Let's return to the die. What if we had an unfair die? Meaning, what if the die was loaded? A loaded die is one in which a small weight is injected inside close to one of the sides. That side will usually land down, so that the number on the opposite side appears.

The book talks about free throws in basketball. There are two possible outcomes, the person either makes it or doesn't. However, the two outcomes are not equally likely. An experienced player will most likely make the shot, while an inexperienced player will not likely make the shot.

In these two examples, the probability of the desired outcome can only be calculated after multiple trials are conducted and the outcomes recorded.