

Chapter 3	Probability
Section 2	Fundamentals

## Probability

### Definitions

We are going to have some trouble here, because the book definitions differ from mine.

#### My Definitions:

Experiment: A series of identical events in which the outcomes are observed.

Event: An observable occurrence that has many possible outcomes.

Outcome: The observable result of an event.

#### The Book Definitions:

Event: A collection of results or outcomes of a procedure.

Simple Event: An outcome that cannot be broken down further.

Sample Space: A listing of all possible simple events in an experiment.

### Notations

$P$	A probability
$A, B, C...$	Specific events
$P(A)$	Probability of event A

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## Probability (cont)

## Rules

## 1. Relative Frequency Approximation

Observing a series of identical events, count the number of times the desired outcome occurs, and then divide that by the number of times the event occurs (statistical application).

## 2. Classical Approach

Given equally likely outcomes (ie: all outcomes have the same probability of occurring), divide the number of ways a particular outcome can occur by the total number of outcomes.

## 3. Subjective Approach

Kirk: Mr. Spock, have you accounted for the variable mass of whales and water in your time re-entry program?

Spock: Mr. Scott cannot give me exact figures, Admiral, so... I will make a guess.

Kirk: A guess? You, Spock? That's extraordinary.

Spock: [to McCoy] I don't think he understands.

McCoy: No, Spock. He means that he feels safer about your guesses than most other people's facts.

Spock: Then you're saying... it is a compliment?

McCoy: It is.

Spock: Ah. Then I will try to make the best guess I can.

## Law of Large Numbers

In our previous example of freshman students seeking help from a counselor, if we were to sample 100 of our freshman students and ask them whether or not they sought help from their advisor, we could obtain the actual frequency and compare it to the theoretical of 35%. We may be close; we may be way off. Interestingly enough, if we select a larger sample, we are more likely to be close to the 35% mark.

The larger the sample, the more likely it is the relative frequency probability will approach the actual probability.

## Probability (cont)

## Complimentary Event

All outcomes in which a desired event does not occur.

The compliment of event  $A$  is written as  $\bar{A}$ .

## Rounding Off Probabilities

Generally, it is best to express the probability as a fraction. Otherwise, round off **final** decimal results to three significant figures.

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## Odds

Actual odds against	$P(\bar{A}) : P(A)$	Note that the sum of the numerator and denominator is always 1.
Actual odds in favor	$P(A) : P(\bar{A})$	
Payoff odds	(net profit) : (amount bet)	

This ratio shows how much you will win for each bet amount. For example, 5:1 means you pocket \$5 for every \$1 you bet.