

Chapter 4: Notes

November 26, 2019

Section 4.1

Probability for Equally likely Outcomes (f/N Rule)

Suppose an experiment has N possible outcomes, all equally likely. An even that can occur in f ways has probability f/N of occurring:

$$Probabilityofanevent = \frac{f}{N}.$$

For an experiment with equally likely outcomes probabilities are identical to relative frequencies (or percentages).

0.1 Basic Properties of probabilities

- Property 1: The probability of an event is always between 0 and 1, inclusive.
- Property 2: The probabilty of an event that cannot occur is 0. (An event that cannot occur is called an impossible event.)
- Property 3: The probability of an event that must occur is 1. (An event that must occur is called a certain event.)

Section 4.2

Sample Space and Event

- Sample Space: The collection of alll possible outcomes for an experiment.
- Event: A collection of outcomes for the experiment, that is any subset of the sample spce. An event occurs if only the outcome of the experiment is a memeber of the event.

Relationships Among Events

- $(\neg A)$: "The event "A does not occur"
- $(A \wedge B)$: "The event "both A and B occur"
- $(A \vee B)$: "The event "either A or B occur"

Mutually Exclusive Events

Two or more events are mutually exclusive events if not two of them have outcomes in common.

Events are mutually exclusive if no two of them can occur simultaneously or, equivalently, if at most one of the events can occur when the experiment is performed.

Section 4.3

Probability Notation

If E is an event, then $P(E)$ represents the probability that event E occurs. It is read "the probability of E."

The Special Addition Rule

If event A and event B are mutually exclusive, then

$$P(A \vee B) = P(A) + P(B).$$

More generally, if events A, B, C,... are mutually exclusive, then

$$P(A \vee B \vee C \vee \dots) = P(A) + P(B) + P(C) + \dots$$

For mutually exclusive events, the probability that at least one occurs equals the sum of their individual probabilities.

The Complementation Rule

For any event A,

$$P(A) = 1 - P(\neg A).$$

The probability that an event occurs equals 1 minus the probability that it does not.

The general Addition Rule

If A and B are any two events, then

$$P(A \vee B) = P(A) + P(B) - P(A \wedge B)$$

For any two events, the probability that at least one occurs equals the sum of their individual probabilities minus the probabilities that both occur.

Section 4.4

Section 4.5