Probability

1. Properties of Probability

(1) Terminology

- denotes the null or empty set;
- A B means A is a subset of B;
- A B is the union of A and B;
- A ∩ B is the intersection of A and B;
- A' is the complement of A (i.e., all elements in S that are not in A).
- Mutually exclusive and Exhaustive events:

$A_1, A_2, \ldots, A_k$ are mutually exclusive events means that A_i ⓑ A_j ≡ î , $i \neq j$; that is, $A_1, A_2, \ldots, A_k$ are disjoint sets;

$A_1, A_2, \ldots, A_k$ are exhaustive events means that A_1

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(3) Venn diagrams

(4) Definition

Probability is a real-valued set function P that assigns, to each event A in the sample space S, a number P(A), called the probability of the event A, such that the following properties are satisfied:

a) $P(A) \geq 0$;
b) $P(S) = 1$;
c) if A_1, A_2, A_3 . . . are events and $A_i \cap A_j =$, $i \neq j$, then

$$P(A_1 \quad A_2 \quad \cdots \quad A_k) = P(A_1) + P(A$$

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d) For each event A, P(A) ≤ 1.
e) If A and B are any two events, then P(A B) = P(A) + P(B) − P(A ∩ B).
f) If A, B, and C are any three events, then P(A B C) = P(A) + P(B) + P(C) − P(A ∩ B) −P(A ∩ C) − P(B ∩ C) + P(A ∩ B ∩ C).

(1) Definition

The conditional probability of an event A, given that event B has occurred, is

defined by ———, p0 0 1 328 0 7 3001203 Fref T14(y:)]63.0f7.8

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If A is an event, then A is the union of m mutually exclusive events, namely,
$A = (B_1 \cap A) \quad (B_2 \cap A)$