Cheat Paper 1 - Stat 5101

Yi DING

Feb. 1, 2018

Set theory (Section 1.4 in the book)

Events and probability (Section 1.5 in the book)

Counting, Permutation (Section 1.7 in the book)

Combination (Section 1.8 in the book)

Binomial Theorem. For all numbers x and y and each positive integer n,

$$(x+y)^n = \sum_{k=0}^{n} \binom{n}{k} x^k y^{n-k}$$

.

Lec-7 Jan. 31, Wed.

Inclusion-Exclusion formula. Show

$$\binom{n}{0}^2$$

$$P(A \cup B) = P(A) + P(B) - P(AB)$$

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(AB) - P(BC) - P(CA) + P(ABC)$$

Lec-5, Jan. 26, Fri.

Combination (Section 1.8 in the book)

Lec-4, Jan. 24, Wed.

Counting, Permutation (Section 1.7 in the book)

Lec-3, Jan. 22, Mon.

Events and probability (Section 1.5 in the book)

Eg. Flip a coin 3 times

$$S = \{HHT, HTH, HTT, HHH, THT, TTH, TTT, THH\}$$

$$S_1 = HHH, S_2 = THH, S_3 = HTH, S_4 = HTT, S_5 = THT, S_6 = TTT, S_7 = TTH, S_8 = HHT$$

$$A = \{\}$$

Easily,

$$B \cap D = \emptyset$$

,

$$B$$

and

$$D$$

are **disjoint**.

What is probability?

In general, given sample space

$$S$$

for any event

$$A \in S$$

, assign a number

$$P(A)$$

for

$$A$$

s.t. 1.

$$P(A) \geq 0$$

2.

$$P(S) = 1$$

3.

$$P(\cup_{i=1}^{\infty} A_i) = \sum_{i=1}^{\infty} P(A_i)$$

if

$$A_1, A_2, ...,$$

are pairwise disjoint.

We say

$$P$$

is a probability.

If

$$P$$

is a probability: 1. (Proof)

$$P(\emptyset) = 0$$

2. (Proof) If

$$A_1, A_2, ..., A_n$$

are pairwise disjoint events, then

$$P(\cup_{i=1}^{n} A_i) = \sum_{i=1}^{n} P(A_i)$$

3. (Proof)

$$P(A^c) = 1 - P(A)$$

4. (Proof) If

$$A \subset B$$

, then

$$P(A) < P(B)$$

5. (Proof) For any event

$$A$$

we have

$$0 \leq P(A) \leq 1$$

6. (Proof)

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Lec-2, Jan. 19, Fri.

Set theory (Section 1.4 in the book) * event * union & intersection * complement * relationship among events * partition

Sample space: run one experiment, put all possible outcomes together, it forms the sample space of this experiment. * Eg.1 Flip a coin.

$$S = H, T$$

* Eg.2 Roll a die,

$$S = 1, 2, 3, 4, 5, 6$$

* Eg.3 Randomly select a person whose birthday,

$$S = 1, 2, ..., 365$$