SOA and CAS: Exam P, Probability[1]
Chapter 1: Sets

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January 13, 2024

(1) *Set:* A set contains all possible outcomes

(1.1) *Properties:*
(1.1.a)

$$(A \cap B) = (B \cap A)$$
$$(A^C \cap B^C) = (A \cup B)^C = 1 - (A \cup B)$$

(1.1.b)

$$(A \cup B) \cup C = A \cup B(\cup C)$$
$$(A \cap B) \cap C = A \cap B(\cap C)$$

(1.1.c)

$$A \cup (B \cap B^C) = (A \cup B) \cap (A \cup B^C)$$
$$(A \cup B) \cap (A \cup C) = A \cup (B \cap C)$$

(2) *Probability:* assign "a real number" to "an event"
(2.1) Mutually Exclusive

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

(2.2) NOT Mutually Exclusive

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

(2.3) *Properties:*
(2.3.a)

$$P(A^C \cap B^C) = P[(A \cup B)^C] = 1 - P(A \cup B) = 1 - [P(A) + P(B) - P(A \cap B)]$$
$$P[(A \cup B) \cap (A \cup C)] = P[A \cup (B \cap C)]$$

(2.3.b)

$$P(B) = P(B \cap A_1) + P(B \cap A_2) + ... + P(B \cap A_n)$$
$$= P(B|A_1) * P(A_1) + P(B|A_2) * P(A_2) + ... + P(B|A_n) * P(A_n)$$
$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C)$$