Sets

Associativity:

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

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

Commutativity:

$A \cap B = B \cap A$

$A \cup B = B \cup A$

Distributivity

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

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

Demorgan's law:

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

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

Indepent events

$P(\Omega_{..i} \cdot A_i) = \prod_{i=1}^{n} P(A_i)$

$P(A_1 \cap A_2 \dots A_n) = P(A_1) \cdot P(A_2) \cdot P(A_3) \dots P(A_n)$

Disjoint events

$\{\phi\} = 0$

$A \cap B = \{\phi\}$

if $(\Omega) = \{A_1, A_2, A_3 \cdots A_n\}$

if $\{A_1 \cap A_2 \cap A_3 \cap A_4 \cap \dots A_n\} = \{\phi\}$

Partition sets

$\{A_1 \cup A_2 \cup A_3 \dots A_n\} = \{\Omega\}$

Defn Probability Condition:

Num # chances of that even happening

such fun should satisfy Axioms Prob

1) Non -ve $P(A) \geq 0$

2) Normalization $P(\Omega) = 1$

3) Infinit Additivity
If events are disjoint $\Big\}$ $P(A_1 \cup A_2 \cup A_3 \dots A_n) = \sum_{1}^{n} P(A_i)$

2 Prob fun

1) equally likely o/c $= \dfrac{1}{\text{No Possible o/c}}$

2) Relative frequency Prob $= \dfrac{\text{Total o/c of A Event}}{\text{No time Experiment}}$

Conditional Prob $P(A|B) = \dfrac{P(A \cap B)}{P(B)}$

Multiplication Rule $P(A \cap B) = P(A|B) \cdot P(B)$

$P(B \cap A) = P(B|A) \cdot P(A)$

$P(A \cap B) = P(B \cap A)$

$P(A|B) \cdot P(B) = P(B|A) \cdot P(A)$

Chain Rule for Probability

$P(A \cap B \cap C) = P(A) \cdot P(B|A) \cdot P(C|A \cap B)$

Total Prob. theorm

Compute $P(B)$ - having $P(B|A)$ & $P(A)$

$P(B) = P(A_1) \cdot P(B|A_1) + P(A_2) \cdot P(B|A_2) \dots$

Bays Theorm:

$P(A|B) = \dfrac{P(A \cap B)}{P(B)} = \dfrac{P(A) \cdot P(B|A)}{P(B)}$

$P(A|B) = \dfrac{P(A) \cdot P(B|A)}{\sum_{i=1}^{n} P(B|A_i) \cdot P(A_i)}$