DISCRETE MATH FORMULAS

SET UNION

Set Union: $A \cup B$

Set Intersection: $A \cap B$

Set Difference: $A - B$

Complement: $A' = U - A$

Subset: $A \subseteq B$

Proper Subset: $A \subset B$

POWER SET

Power Set: $\mathbb{P}(A)$

Cartesian Product: $A \times B$

Cardinality: $n(A)$

Inclusion-Exclusion
$n(A \cup B) = n(A) + n(B) - n(A \cap B)$

Three Sets:
$n(A \cup B \cup C) = \sum_n - \sum_n + n(A \cap B \cap C)$

De Morgan Laws: $(A \cup B)' = A' \cap B'$

DE MORGAN LAWS

De Morgan Laws: $(A \cap B)' = A' \cup B'$

Propositional Logic: $p \wedge q$

Disjunction: $p \vee q$

Negation: $\neg p$

Implication: $p \rightarrow q$

Biconditional: $p \leftrightarrow q$

TAUTOLOGY

Tautology: Always true

Contradiction: Always false

Permutation: ${}_nP_r = \frac{n!}{(n-r)!}$

Combination: ${}_nC_r = \frac{n!}{r!(n-r)!}$

Factorial: $n! = n(n-1)\ldots1$

Pigeonhole Principle:
n items in k boxes $\Rightarrow \geq \left\lceil \frac{n}{k} \right\rceil$

GRAPH DEGREE

Graph Degree: $\sum \deg(v) = 2E$

Contradiction: $\sum \deg(v) = 2E$

Complete Graph: K_n edges $= \frac{n(n-1)}{2}$

Path Length: Number of edges

Tree Edges: $n-1$

Binary Tree Nodes: $\leq 2^h - 1$

Recurrence: $T(n) = aT(n/b) + f(n)$

MASTER THEOREM

Master Theorem: Compare $f(n)$ with $n^{\log_b a}$

Divisibility: $a|b$

Modular Arithmetic: $a \equiv b \pmod{n}$

GCD: $\gcd(a,b)$

LCM: $\frac{a \times b}{\gcd(a,b)}$

Boolean Algebra: $A + A' = 1$

WONTEN THEOIRE

Master Theorem: $f(n)$ with n^m

Divisibility: $a|b$

Modular Arithmetic: $a \equiv b \pmod{n}$

Tree Edges: $n-1$

Binεy Tree Nodes: $\leq 2^h - 1$

Recurrence: $T(n) = aT\left(\frac{n}{b}\right) + f(n)$

BOOLEAN ALGEBRA

Boolean Algebra: $A \cdot A' = 0$

Boolean Algebra: $A + 0 = A$

Boolean Algebra: $A \cdot 1 = A$

Boolean Algebra: $A + A = A$

Boolean Algebra: $A \cdot A = A$