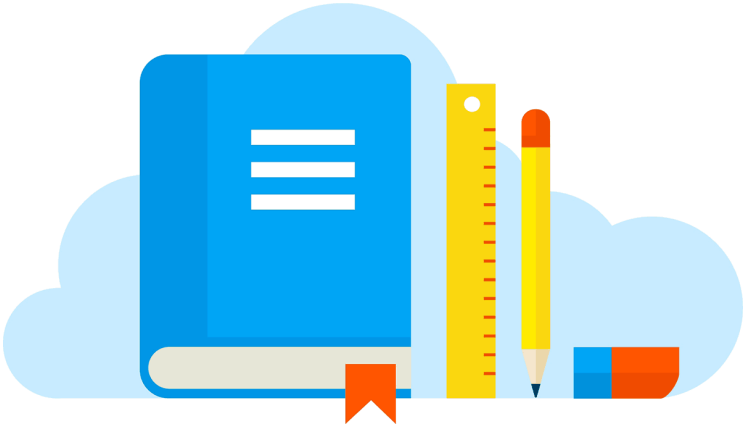

Algos à connaitre

Regle importante: arrèter le sexe, surtout la pornographie.

Affronter le stress, éliminer la pression de l'école en prenant au sérieux les études, les projets et autres.

Date : 20/04/2025

.

🔶 1. Dynamic Programming (DP)

Problème	Complexité	Idée clé

LIS (Longest Increasing Subsequence)	O(n log n)	Patience sorting + bisect
Knapsack 0/1	O(nW)	DP[i][w] = max(val) with weight w
DP on Trees	O(n)	DFS + substructure reuse
Digit DP	O(pos * tight * ...)	DP by digit positions
Bitmask DP	$O(2^n \cdot n)$	Subset problems (e.g., TSP)
DP on intervals	$O(n^3)$ or $O(n^2)$	Split intervals, e.g., matrix chain mult.
Optimized DP (Convex Hull, Monotonic)	O(n)–O(n log n)	Special structures to reduce loops

---

🔷 2. Graph Algorithms

Problème	Complexité	Idée clé
Dijkstra (heap)	O((V+E) log V)	Shortest path with non-negative weights
Bellman-Ford	O(V·E)	Works with negative weights
Floyd-Warshall	$O(n^3)$	All pairs shortest path
Topological Sort	O(V + E)	DAG ordering

Tarjan (SCC / Biconnected)	O(V + E)	Low-link + DFS timestamps
Kosaraju's SCC	O(V + E)	DFS postorder + reverse graph
Prim / Kruskal (MST)	O(E log E)	Minimum spanning tree
0-1 BFS	O(V + E)	BFS for edges with 0 or 1 weight
Johnson's Algorithm	O(V² log V + VE)	All pairs shortest path with neg weights

---

🔸 3. Trees and LCA

Problème	Complexité	Idée clé
Binary Lifting (LCA)	O(log n) query	Parent[k][node] table
Euler Tour + RMQ (LCA)	O(1) query	RMQ on depth array
Heavy-Light Decomposition	O(log² n) query	Decompose into paths
Centroid Decomposition	O(n log n)	Divide-and-conquer on tree
Segment Tree on Tree (HLD)	O(log n) updates	Combine with HLD

🔹 4. String Algorithms

Problème	Complexité	Idée clé

KMP (Prefix Function)	O(n + m)	Border array
Z-algorithm	O(n)	Longest prefix starting at i
Rabin-Karp Hash	O(n + m)	Rolling hash
Suffix Array + LCP	O(n log n)	Sort suffixes, longest common prefix
Aho-Corasick (Multi-pattern)	O(n + total len)	Trie + failure links
Manacher's Algorithm	O(n)	Palindromic substrings
Suffix Automaton / Trie	O(n)	All substrings

🟢 5. Number Theory

Problème	Complexité	Idée clé
Sieve of Eratosthenes	O(n log log n)	Precompute primes
Modular Exponentiation	O(log b)	Binary exponentiation
GCD / Extended GCD	O(log a)	Bezout identity
Modular Inverse (Fermat)	O(log m)	$a^{-1} \equiv a^{(m-2)} \bmod m$
Chinese Remainder Theorem	O(k)	Solve mod equations
Miller-Rabin (Primality Test)	Probabilistic	Fast primality check

Pollard's Rho (Factoring)	Heuristic O(n^¼)	Fast integer factorization

---

🟠 6. Geometry

Problème	Complexité	Idée clé
Convex Hull (Graham/Andrew)	O(n log n)	Upper/lower hull
Line Sweep	O(n log n)	For intersection, closest pair, etc.
Rotating Calipers	O(n)	Max distance in convex hull
Segment Intersection	O(n log n)	Sweep line + set
Point in Polygon (Ray Cast)	O(n)	Ray intersection count

🧠 7. Others (Hardcore & Niche)

Problème	Complexité	Idée clé
Mo's Algorithm (Range Queries)	O((n + q) √n)	Sort queries smartly
DSU (Union Find)	O(α(n))	Disjoint sets
DSU on Tree	O(n log n)	Small to large merging
Sqrt Decomposition	O(√n) query	Block-based range queries

Persistent Segment Tree	O(log n)	Keep past versions
Dynamic Connectivity (Link Cut Tree)	$O(\log^2 n)$	Update tree edges online
FFT / NTT	O(n log n)	Polynomial multiplication
Berlekamp-Massey	$O(n^2)$	Find shortest linear recurrence
Matrix Exponentiation	O(log k)	Recurrence in matrix form