P Vs NP Problem

Sr.No	Key Points	P Class	NP Class
1	Problem Nature	P problems are decision problems that can be solved efficiently in polynomial time	NP problems are decision problems for which a proposed solution can be verified efficiently in polynomial time
2	Solving vs. Verifying	P focuses on finding a solution to a problem efficiently	NP focuses on verifying a given solution efficiently
3	Algorithm Efficiency	P problems have algorithms that can solve them in polynomial time	NP problems may have algorithms to verify solutions in polynomial time but may not have known algorithms to solve them efficiently.
4	Algorithm Complexity	P problems have deterministic algorithms with known time complexity	NP problems generally lack known deterministic algorithms with efficient time complexity.
5	Potential Equivalence	If P = NP, it implies that problems with verified solutions also have efficient algorithms to find solutions.	If P ≠ NP, it means that finding solutions may be significantly more challenging than verifying them.
6	Deterministic vs. Non-deterministic	P problems are solvable by deterministic algorithms (always produce the same output for a given input).	NP problems can be verified by non-deterministic algorithms (may produce different outputs for the same input).
7	Certainty vs. Guessing	P problems are about certainty—finding a solution deterministically.	NP problems may involve a level of "guesswork" in finding a potential solution that can be efficiently verified.
8	Algorithm Speed	Algorithms for P problems run in a predictable,	For NP problems, the speed of the algorithm

		efficient manner based on the size of the input.	can vary based on the "lucky guesses" made during the solving process.
9	Complexity Classes	P is a subset of NP (P ⊆ NP), as any problem that can be solved quickly (in P) can also be verified quickly (in NP).	It is unknown whether P is equal to NP (P = NP) or not (P ≠ NP), and this is the essence of the P vs. NP problem.
10	Examples	Selection sort, Linear Search	Travelling salesman problem and the knapsack problem.