# Assignment 42

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Say we have some search problem $\Pi$ with input size $n$. Since every search problem in NP can be expressed as a series of decision problems, the worst case is that we have have to examine both possible answers ("yes" and "no") for every single input $\in [0, n]$. So there are somewhere around $2^n$ subproblems.

If it's nondeterministically solvable in polynomial time (that is, given a machine that can explore an arbitrary number of solutions simultaneously—the definition of NP), all these subproblems themselves must be also solvable in polynomial time, let's say specifically $p(n)$.

So each problem costs at most $p(n)$ for some polynomial function $p$. If there are $2^n$ subproblems at worst, then the total cost for all problems in NP must be $O(2^{p(n)})$.