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Prove that Travelling Salesman Problem (TSP) is NP-complete
Given that Hamiltonian Cycle (HC) is NP-complete

Proving $HC <_p TSP$:

Given a graph to solve for HC, $G(V, E)$ construct another graph $G'(V', E')$. where $c : e \longrightarrow \mathbb{R}$; $e \in E'$
where $V' = V$
for $e \in E$, $c(e) = 1$
for $e \notin E$, $c(e) = 2$
add all edges to E'
now ask TSP is $TSP(G') < |V| + 1$
if answer is true then there exist a cycle where no edge where $c(e) = 2$
that means the cycle belongs in G.
We have solved HC

Proving $TSP \in NP$:

given an instance of TSP solution for yes,
we can add the values together in linear time to verify
$\therefore TSP \in NP$.