Vertex Cover (VC)

Input: An undirected graph $G = (V, E)$ and an integer $k > 0$.

Question: Is there a vertex cover of $G$ of size at most $k$, i.e., is there a subset $V' \subseteq V$ such that $|V'| \leq k$ and for all edges $(u, v) \in E$, at least one of $u$ and $v$ is in $V'$?

Vertex Cover Cost (VC-C)

Input: An undirected graph $G = (V, E)$.

Output: The size of the smallest vertex cover of $G$.

Vertex Cover Example (VC-E)

Input: An undirected graph $G = (V, E)$.

Output: One of the smallest vertex covers of $G$. 
Clique

Input: An undirected graph $G = (V, E)$ and an integer $k > 0$.

Question: Is there a clique in $G$ of size at least $k$, i.e., is there a subset $V' \subseteq V$, $|V'| \geq k$, such that for all $u, v \in V'$, $(u, v) \in E$?

Subset sum (SS)

Input: A set $S \subset \mathcal{N}$ of integers and an integer $k \geq 0$.

Question: Is there a subset $S'$ of $S$ whose elements sum to $k$?

Steiner tree in graphs (STG)

Input: An undirected graph $G = (V, E)$, a set $V' \subseteq V$, and an integer $k > 0$.

Question: Is there a tree in $G$ that connects all vertices in $V'$ and contains at most $k$ edges?