

1. Study Group

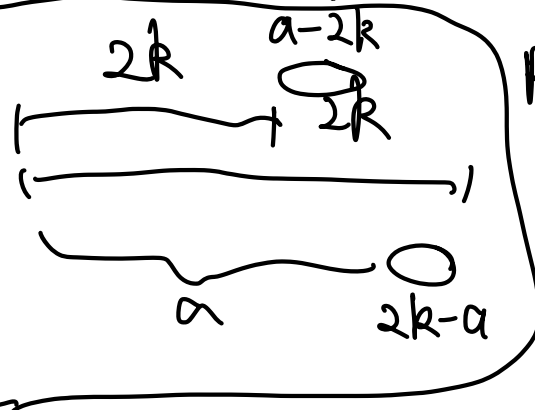
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2. (a) SUBSET SUM \leq_p PARTITION

Assume $a = \sum_{i=1}^n a_i$, we consider 2 cases:

① $2k - a \geq 0$. Then we construct a set $B = A \cup \{2k - a\}$.
Run PARTITION on B then we get 2 partitions ^{each} with sum k . Return the partition without $2k - a$ to be solution of PARTITION on A . Also, no sol for PAR on $B \Leftrightarrow$ no sol for SS on A .

② $2k - a < 0$. Then we construct $B = A \cup \{a - 2k\}$.



Run PAR on B then getting 2 partitions (if exist), each with sum $a - k$. Return ~~the~~ all the other elements except $a - 2k$ in the subset with $a - 2k$ as

a sol of SUBSET SUM on A . Also, no sol for PAR on $B \Leftrightarrow$ no sol for SS on A .

(b) SUBSET SUM \leq_p KNAPSACK

Construct a Knapsack as below:

For each $a_i \in A$, add item with weight a_i and value a_i as well, getting a knapsack B .

Set $W = V = k$. Run Knapsack alg on B , getting a subset of A that

$$\begin{cases} \sum_{i \in \text{subset index}} a_i \leq W = k \\ \sum_{i \in \text{subset index}} a_i \geq V = k \end{cases} \Rightarrow \sum_{i \in \text{subset index}} a_i = k \quad (\text{if exist})$$

index

So we have a sol for SS on A that consists of the elements KNAPSACK returns. Also, no sol for KNAPSACK on B \Leftrightarrow no sol for SS on A.