2-PART-EQ : Given $2n$ integers $a_1 \dots a_{2n}$.

Is there a subset I of $\{1, \dots 2n\}$ such that

$\sum_{i \in I} a_i = \sum_{i \notin I} a_i$ with $|I| = n$.

Step 1 - 2PARTEQ $\in NP$.

Step.2 - Pick pb 2-PART to do our reduction (2P)

Step.3 - I_1 : instance of 2-P.

n int. $a_1 \dots a_n$ $\to I$

Create I_2 : $a_1+1, a_2+1, \dots, a_n+1, \underbrace{1, \dots, 1}_{n}$

I'

(done in poly time!)

* If I_1 has a sol. I $\to \frac{S}{2}$

$\Rightarrow$ Create a sol to I_2 by taking

$\{a_i + 1\}_{i \in I}$, $n - |I|$ elts

each set has weight $\frac{S}{2} + n$ of weight 1

[redacted]

$\rightarrow$ Sol. to I_2, I'.

$$\sum_{i \in I'} (a_i + 1) + n - |I'| = \frac{S}{2} + n$$

because $|I'| = n$

$$\sum_{i \in I'} a_i = \frac{S}{2} \quad \rightarrow I' \text{ defines a sol for } I_1$$

[redacted]