num1 = [1, 2] num2 = [-2, -1] num3 = [-1, 2] num4 = [0, 2]

→ group_list = [[1,2] [-2,-1] [-1,2] [0,2]]

→ left_half_group = [[1, 2] [-2, -1]] # Represents a+b

→ Right_half_group = [[-1 2] [0 2]] # Represents c+D

To find out sum (a+b)+(c+d)=0, we can find

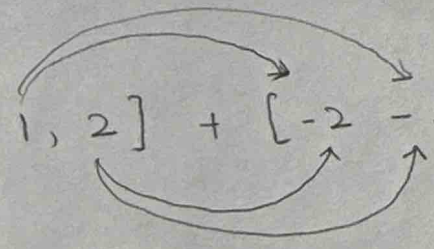
$x + -x = 0$, $x = (a+b)$, $-x = c+d$

i.e $\underset{x}{1} + \underset{-x}{(-1)} = 0$ or $\underset{x}{4} + \underset{-x}{(-4)} = 0$

→ If we find out similar number with opposite sign from a different groups the we get a solution of $\underset{x}{(a+b)} + \underset{-x}{(c+d)} = 0$

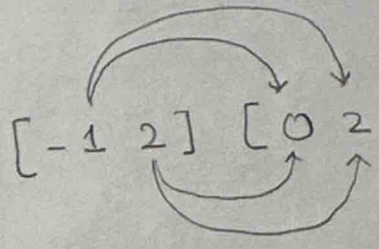
To calculate sum of 2 list, we can take dot product b/n them

Eg: [1, 2] + [-2 -1] =



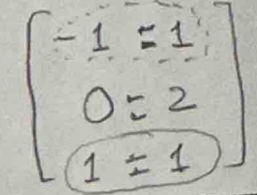
		Count
1+(-2) = -1	→	1
1+(-1) = 0	→	2
2+(-2) = 0		
2+(-1) = 1	→	1

[-1 2] [0 2] =

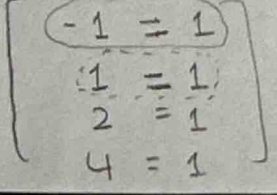


		Count
-1+0 = -1	→	1
-1+2 = 1	→	1
2+0 = 2	→	1
2+2 = 4	→	1

list half 1



list half 2



Now we see we have

* -1 from list 1

1 from list 2

* 1 from lst 1

- 1 from lst 2

Count = list 1 (count) * list 2 (count)

ie $-1:(1) * 1:(1) = 1 \times 1 = 1$

Similarly

$1:(1) * -1:(1) = 1 * 1 = 1$

$+ \quad 2$

$\downarrow$

This states that there are 2 combinations with sum = 0

Tip: To take dot product & count use a dictionary