

Split array problem

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Solution explanation

Because we know that both lists have the same average value, we can write the following equation:

$$\frac{a}{n} = \frac{b}{m}$$

where:

a = the sum of the elements in the **first** list

n = the length of the **first** list

b = the sum of the elements in the **second** list

m = the length of the **second** list

We also know that $a + b = s$, where s is the sum of all the elements in the input list, and $n + m = l$, where l is the length of the input array we can write

$$\frac{a}{n} = \frac{s - a}{l - n}$$

By cross-multiplication we obtain:

$$a * (l - n) = n * (s - a) \Leftrightarrow a * l - a * n = n * s - a * n$$

$$\Leftrightarrow a * l = n * s$$

$$\Leftrightarrow a = \frac{s * n}{l}$$

In the end, we obtain that in order to check if we can split a list into two lists that have the same average value, we can reduce the problem to finding a list of elements of length l having the sum of all elements equal to a .

Because all elements in the input list are integer values, when we split the list into two lists, we will obtain the sum of elements to be also an integer value. From this, we can determine that the sum of the sum “a” for the first list will also be an integer which means that $s * n$ must be divisible by l . This relation can be used in order to speed up the searching.