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Filling Jars

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Average

Given $oldsymbol{N}$ numbers in an array $oldsymbol{Arr}[]$, their average can be calculated as

$$\frac{\sum_{i=0}^{N-1} Arr[i]}{N}$$

It is interesting to note that on any increase/decrease in existing values or addition of new values the average can be recalculated without summing the whole array again, hence reducing the update operation from O(n) to O(1).

Say, average is given by $m{av}$ and we add one more element $m{K}$; now size is $m{N+1}$. The new average can be calculated as

$$rac{av imes N + K}{N+1}$$

Similarly, if all or number of elements (Q) are increased by some amount (K), the new average becomes

$$\frac{av \times N + Q \times K}{N}$$

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