Filling Jars

Average

Given N numbers in an array $Arr[]$, 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 av and we add one more element K; now size is $N+1$. The new average can be calculated as

$$\frac{av \times N + K}{N+1}$$

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

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