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Hands-On 6 Math Derivation

To calculate the complexity of a non-random pivot implementation of QuickSort, we will assume that we always use the rightmost element as our pivot, and that the time complexity is $T(n) = n \lg n$.

Average case: $T(n) = T(n/2) + T(n/2) + n$

Substitute using $T(n) = n \lg n$

$$n \lg n = \frac{n}{2} \lg\left(\frac{n}{2}\right) + \frac{n}{2} \lg\left(\frac{n}{2}\right) + n$$

$$n \lg n = n \lg\left(\frac{n}{2}\right) + n$$

$$n \lg n = n(\lg n - \lg 2) + n$$

$$n \lg n = n(\lg n - 1) + n$$

$$n \lg n = n \lg n - n + n$$

$$n \lg n = n \lg n \checkmark$$