

# Re: How to prove that a random sort algorithm converges?

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[James]

Supposed I want to sort four numbers {5, 2, 4, 3}  
I randomly select a pair of two numbers at adjacent positions, say  $i$  and  $i+1$ , and I swap their position if the value at position  $i$  is greater than the value at position  $i+1$  (e.g.,  $5 > 2$  so swap their positions).

If I do this (random selection and ordering) long enough, I would expect that the numbers are sorted.

My question is: how do I prove that this algorithm converges?

[Tim Peters]

I'd try proof by induction on the number of inversions. An "inversion" is an index pair  $\langle i, j \rangle$  where  $i < j$  and  $x_i > x_{i+1}$ .

Oops! My mistake: that should say

where  $i < j$  and  $x_i > x_j$

The rest wasn't affected by that mistake, simply because the rest had the correct definition of inversion in mind ;-) Like so:

For example, in your example there are 4 inversions:  $5 > 2$ ,  $5 > 4$ ,  $5 > 3$ , and  $4 > 3$ .

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