

الناظرهای 98411387

حوزه سبزیاری 98412004

① 15, 20, 10, 18 → A

1. ابتدا کوچک ترین عنصر را پیدا می کنیم و در ابتدای آرایه قرار می دهیم: 10, 15, 20, 18

2. حال کوچک ترین عنصر را بین عناصر از 10 به بعد پیدا می کنیم و بعد از 10 قرار می دهیم:

10, 15, 20, 18

3. دوباره کوچک ترین عنصر بین عناصر باقی مانده (20, 18) پیدا کرده و بعد از

15 قرار می دهیم: 10, 15, 18, 20 → sorted ✓

② B

همان طور در بالا توضیح داده شد، مقایسه selection sort به این گونه است که در هر مرحله

کوچک ترین عنصر بین عناصر unsorted را انتخاب می کنند و می رانیم برای این منظور،

برای یک آرایه n عنصری، 1-n مرحله نیاز است که برای 20 عنصر، 19 مرحله

می شود.



Proof by Induction:

: إثبات

1. Base case ( $n=1$ ): If the number of elements are 1, then the number of steps are 0, cause we don't need to sort 1 element with itself. ✓

2. Inductive step: Assume that the following equation, is applied to  $n$  elements, so the number of steps, are  $n-1$ .

Now we need to proof that this equation is hold for  $n+1$  elements too and then conclude that it holds for any value of  $n$ .

— Proof that  $n+1$  elements, need  $n$  steps:

First separate  $n+1$  elements into  $n$  plus 1 elements.



$$n + 1 \xrightarrow[\text{elements need } n-1 \text{ steps}]{\text{we assumed that } n} (n-1) + 1$$

Now we want to sort  $(n-1)$  element which are sorted and one element. It's like that we have two elements and we can use the inductive step. So the number of steps are :

$$(n-1) + 1 = n \quad \checkmark$$

$$\textcircled{3} \quad D \quad \frac{7 \times 6}{2} = 21$$

Finding the lowest element, requires  $n-1$  comparison and then swapping it into the first position. Finding the next lowest element needs to search in the remaining  $n-1$  elements and

like this we have  $(n-1) + (n-2) + \dots + 2 + 1 = \frac{n(n-1)}{2}$  Comparison.





C

selection sort after 4 iteration : 1 2 3 4 ...

- It can't be selection sort, because in selection sort, after  $n$  iteration, the first  $n$  elements are fully sorted, like above.

- It might be insertion sort, because in insertion sort, after  $n$  iterations, the first  $n$  elements are sorted with respect to each other, but it is not in its final state.