Selection Sort e Insertion Sort

Prof. Andrey Masiero

12 de setembro de 2017

Agenda

Selection Sort

- Busca pelo menor elemento no vetor;

Selection Sort

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- Depois posiciona ele na primeira posição;

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- Realiza novamente o processo para todos elementos até $n - 1$;

Selection Sort

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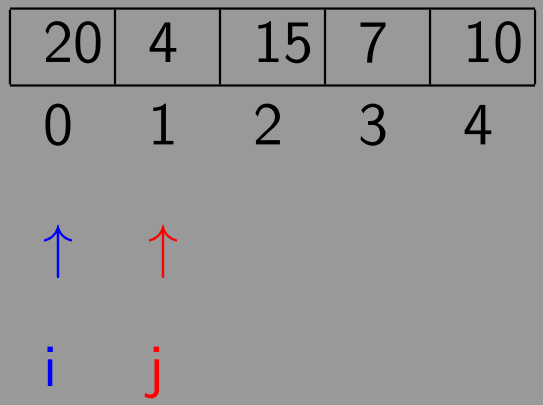
- Depois posiciona ele na primeira posição;
- Realiza novamente o processo para todos elementos até $n - 1$;
- Complexidade dele: $O(n^2)$.

Selection Sort

Vamos ordernar este vetor!

20	4	15	7	10
0	1	2	3	4

Selection Sort



$troca = 0$

- inicializa $i = 0$; $j = i + 1$;

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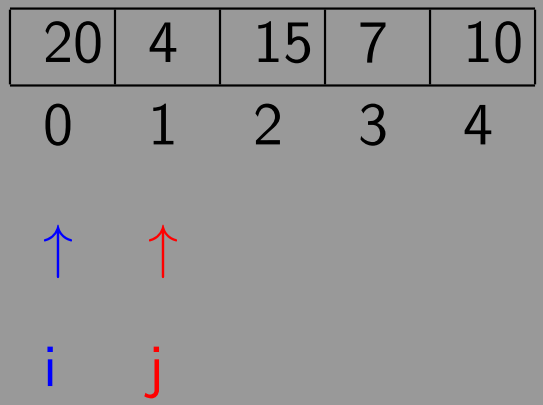

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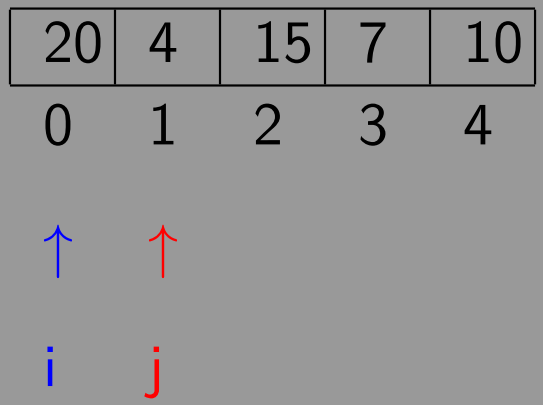

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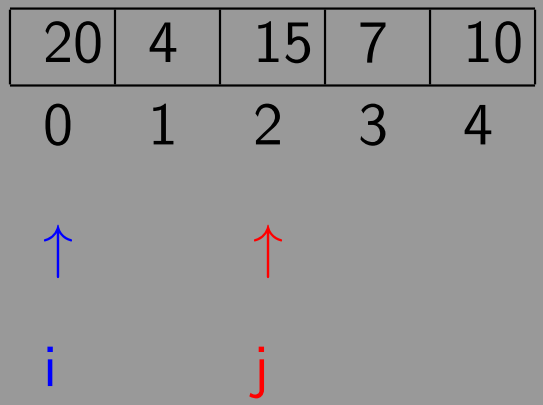
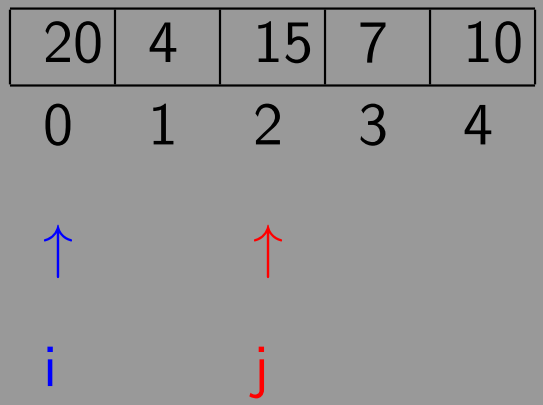


$troca = 1$

- $j = j + 1;$

Selection Sort



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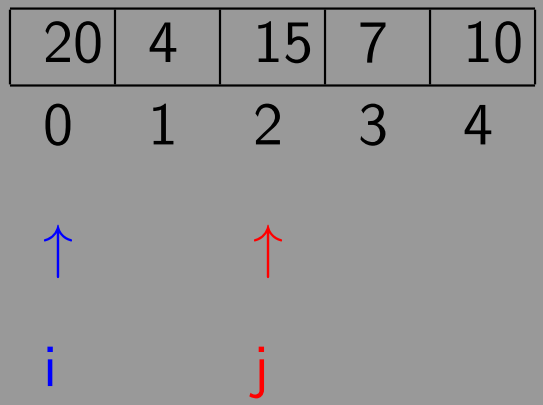

$troca = 1$

- $j = j + 1$;
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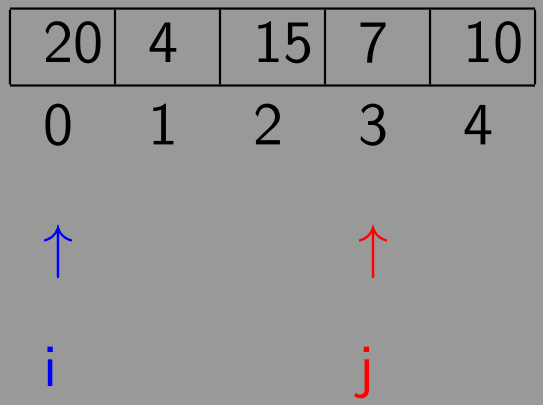
- próximo

Selection Sort



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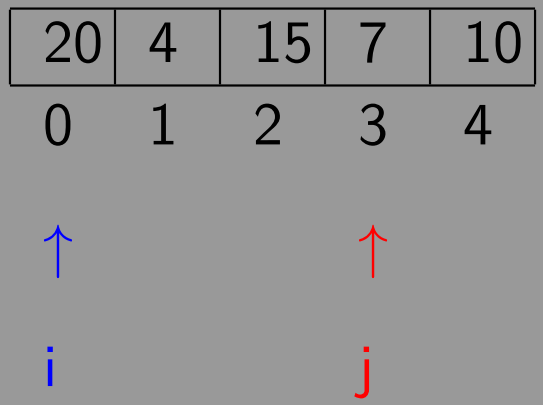

$troca = 1$

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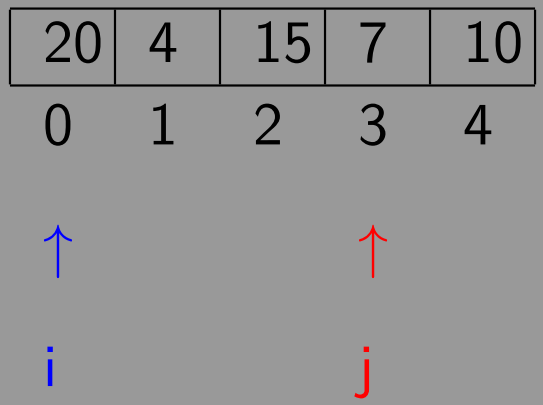
Selection Sort



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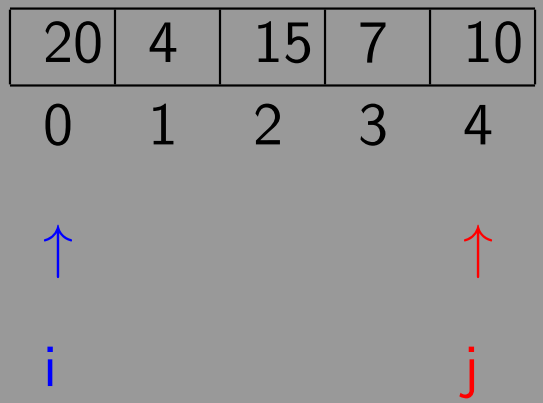
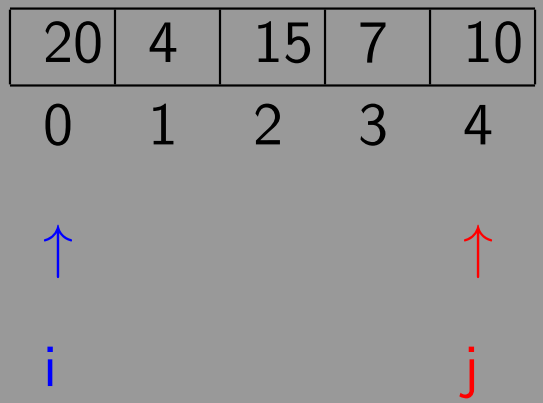
Selection Sort



$troca = 1$

- finalizou o vetor

Selection Sort



$troca = 1$

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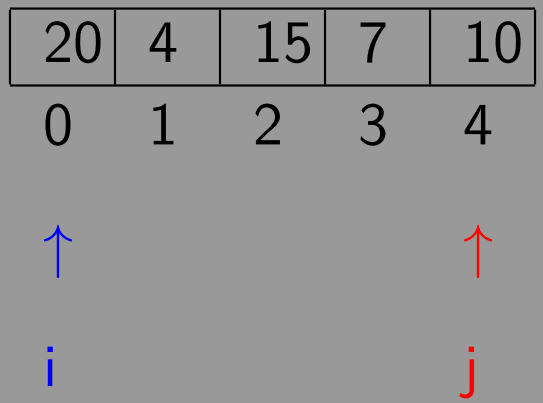
- $swap(vetor[i], vetor[troca])$

Selection Sort



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- $i = i + 1$; $j = i + 1$; $troca = i$

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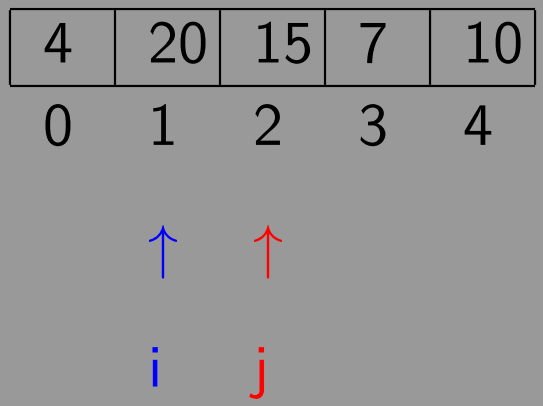
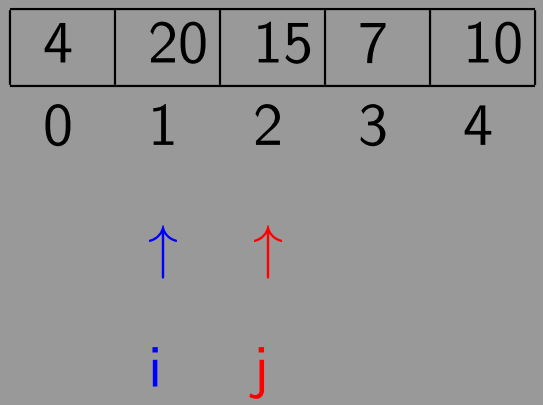


$troca = 1$

- $20 > 15$? Sim

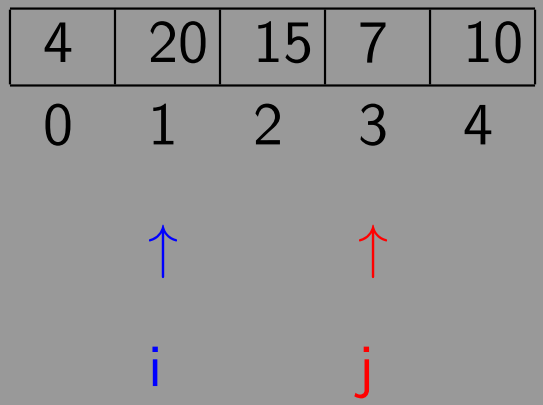
Selection Sort



$troca = 1$

- $20 > 15$? Sim
- $troca = j$

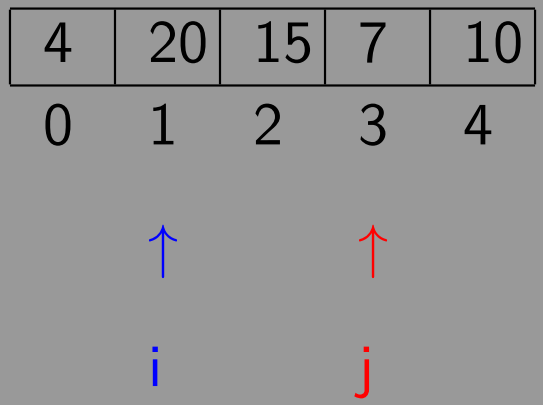
Selection Sort



$troca = 2$

- $j = j + 1;$

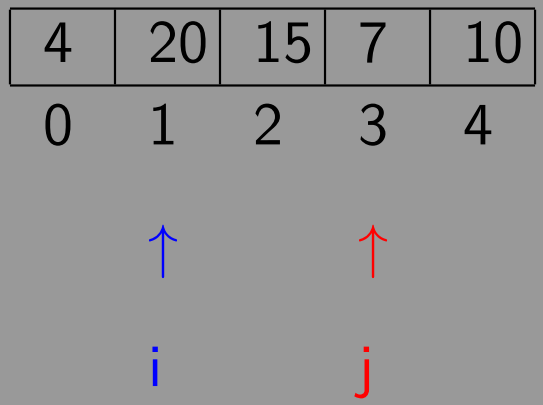
Selection Sort



$troca = 2$

- $j = j + 1$;
- $15 > 7$? Sim

Selection Sort



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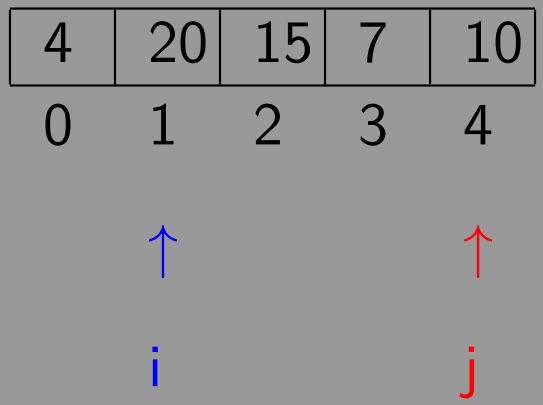

$troca = 3$

- $j = j + 1;$

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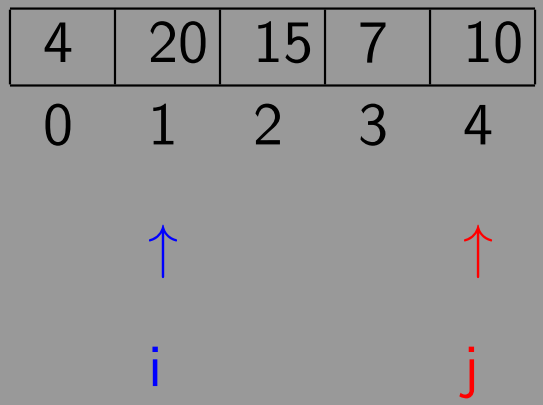

$troca = 3$

- $j = j + 1$;
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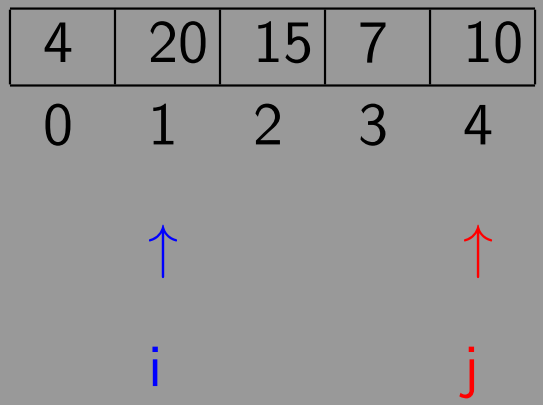

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- $j = j + 1$;
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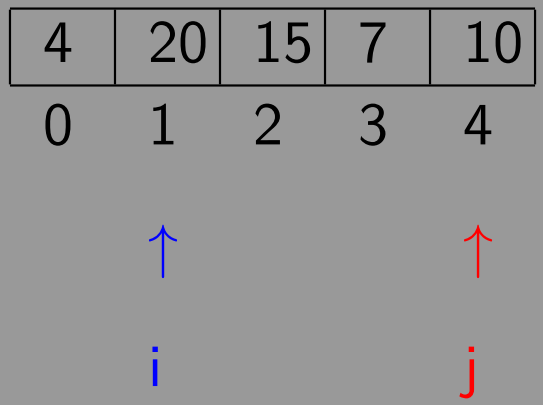
- próximo

Selection Sort



$troca = 3$

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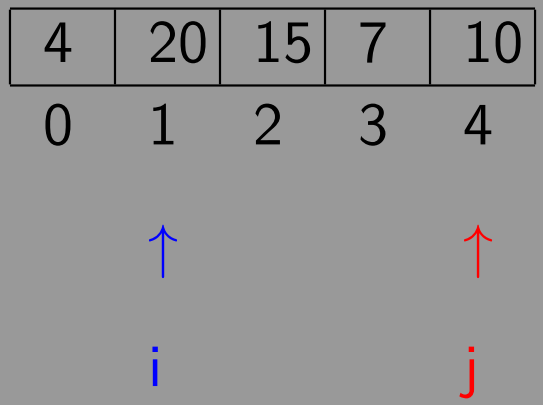

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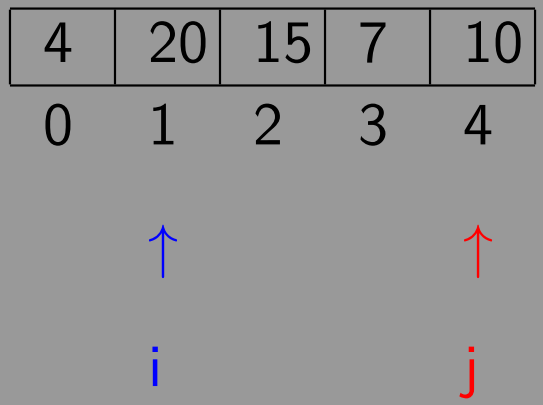

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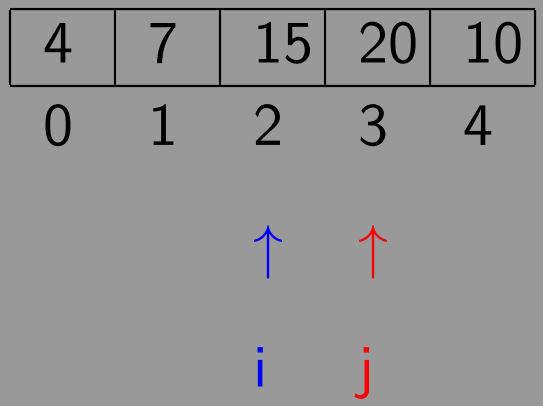

$troca = 2$

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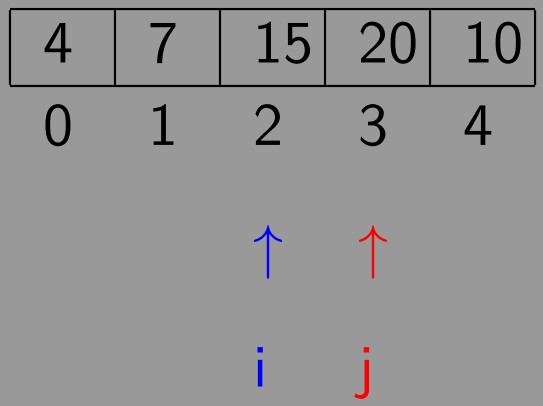

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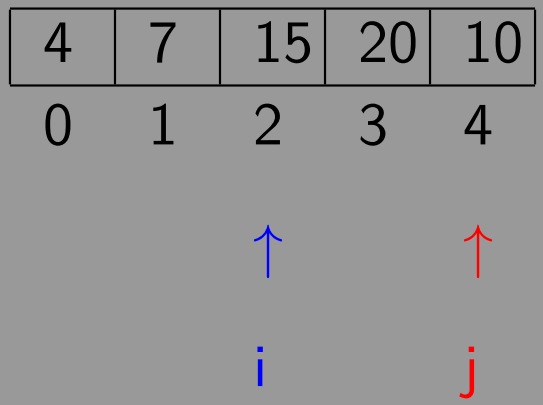

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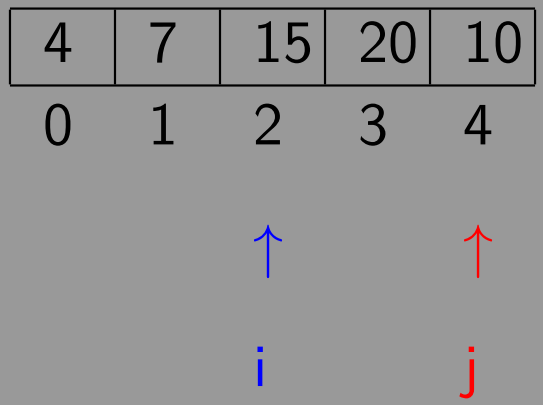

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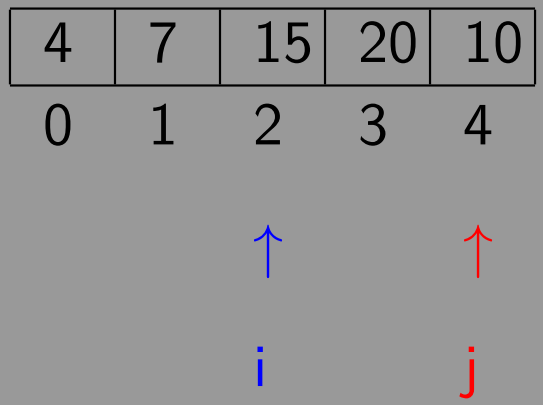

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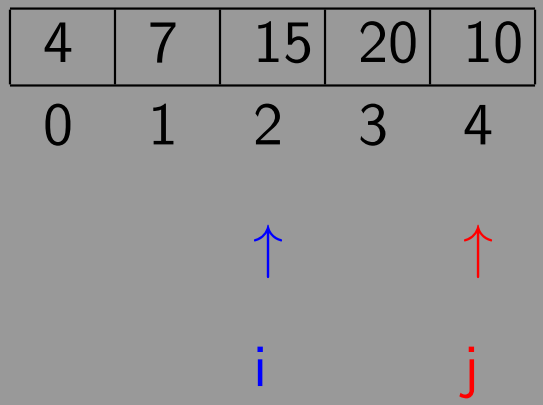
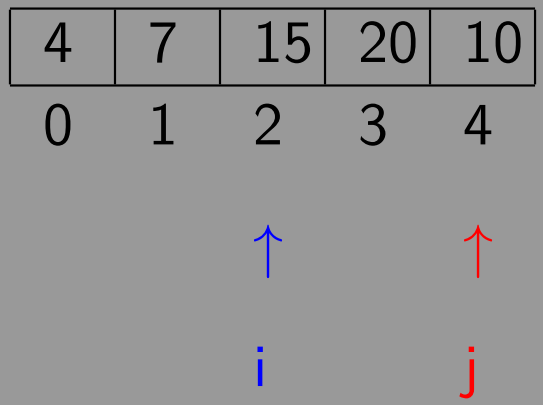


$troca = 4$

- finalizou o vetor

Selection Sort



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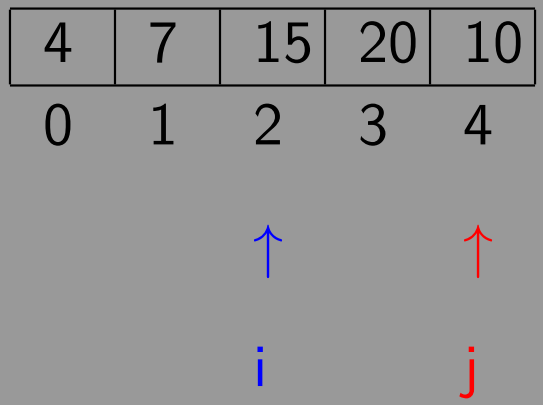

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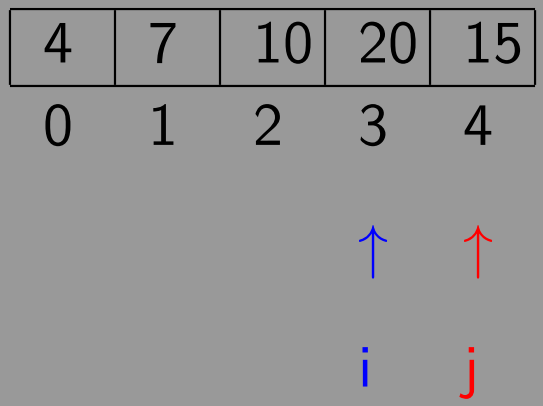

$troca = 3$

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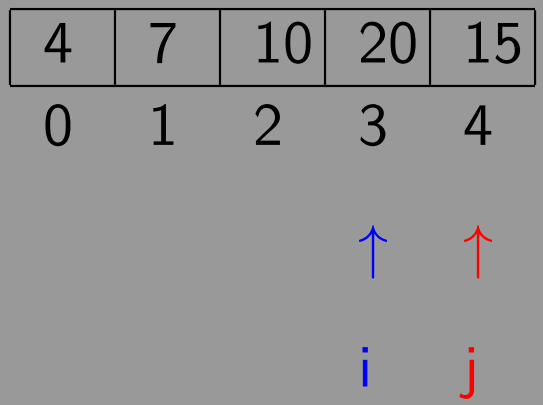

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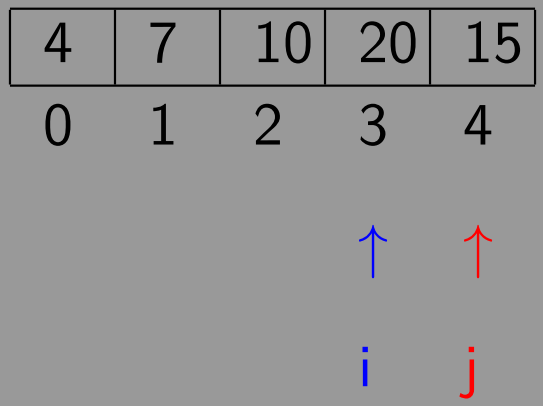
Selection Sort



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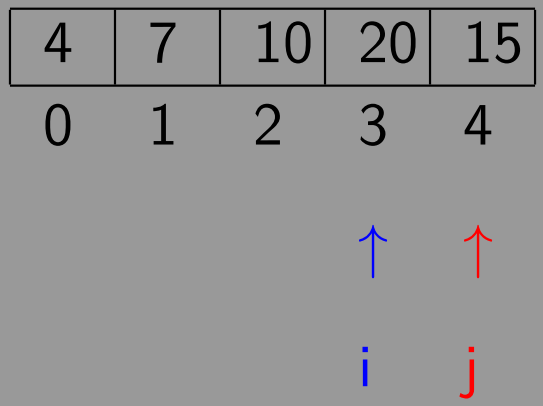

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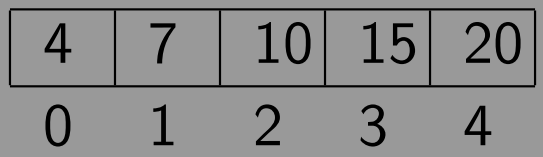

Vetor Ordenado

Selection Sort

```
vetor[] = {20, 4, 15, 7, 10}

for (i = 0; i < vetor.length - 1; i++)
    indice_menor = i
    for (j = i + 1; j < vetor.length; j++)
        if (vetor[j] < vetor[indice_menor])
            indice_menor = j
    swap(vetor[j], vetor[j + 1])
```

Insertion Sort

- Utilizando um vetor auxiliar;

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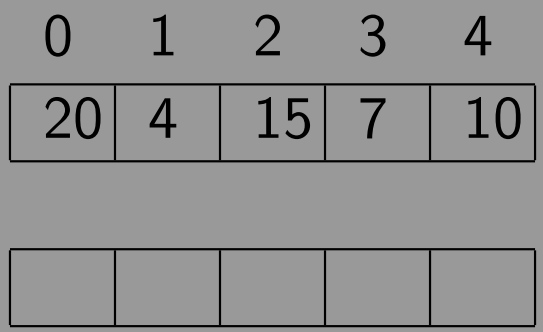

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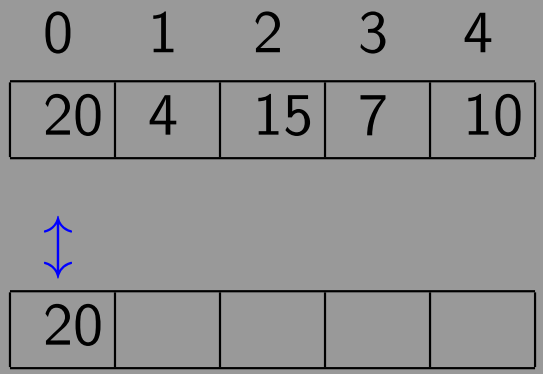
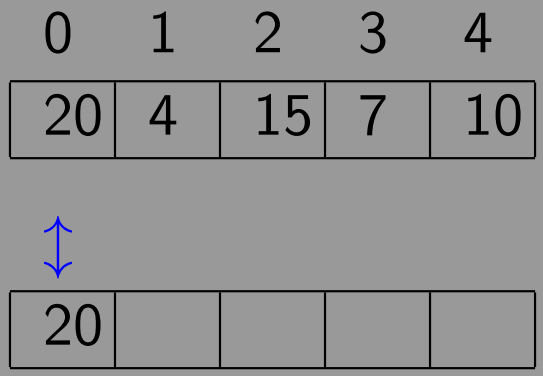


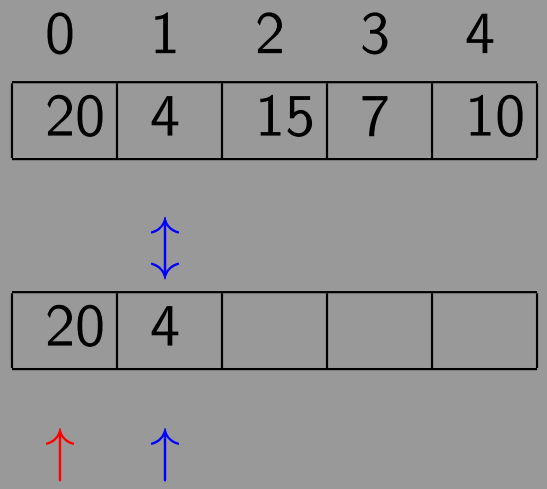
- inicializa $i = 0$;

Insertion Sort



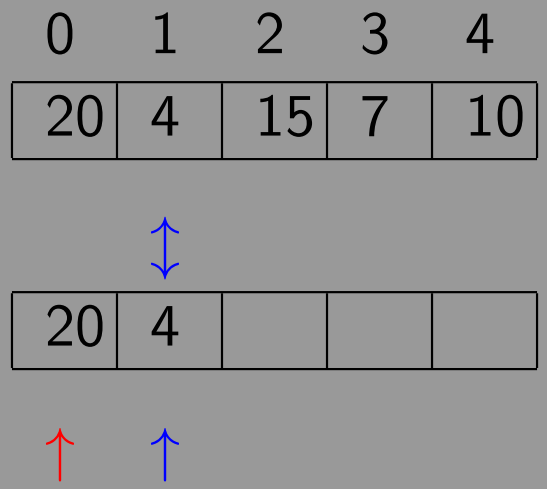
- inicializa $i = 0$;
- copia o $vetor[i]$ para a posição 0 do vetor auxiliar

Insertion Sort



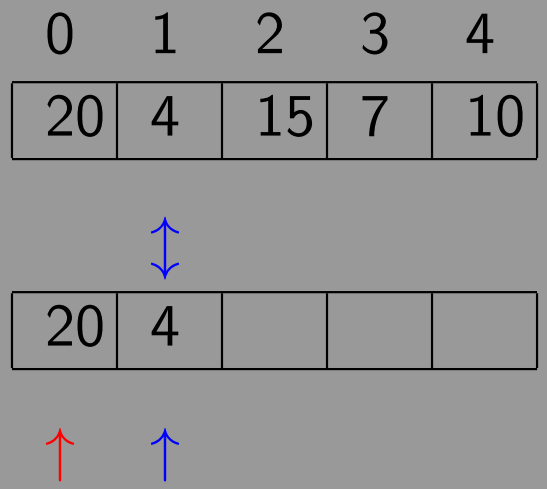
- $i = i + 1$; inicializa $j = i - 1$

Insertion Sort



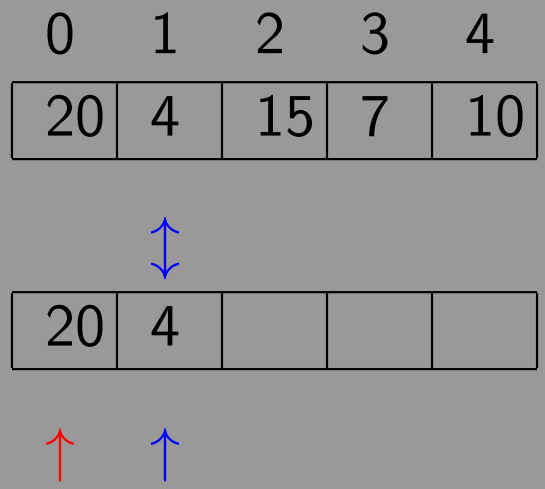
- $i = i + 1$; inicializa $j = i - 1$
- $4 < 20$? Sim

Insertion Sort



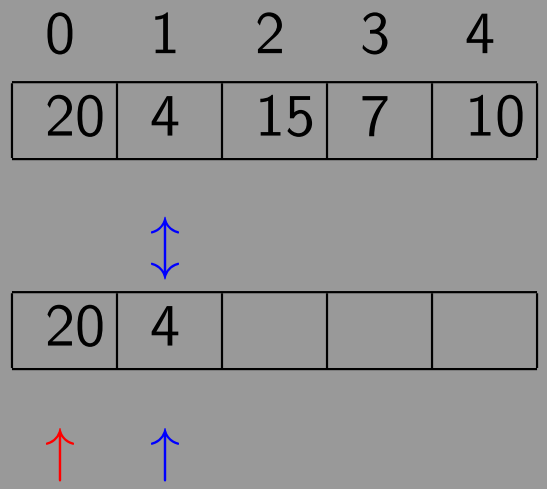
- $i = i + 1$; inicializa $j = i - 1$
- $4 < 20$? Sim
- $j = j - 1$

Insertion Sort



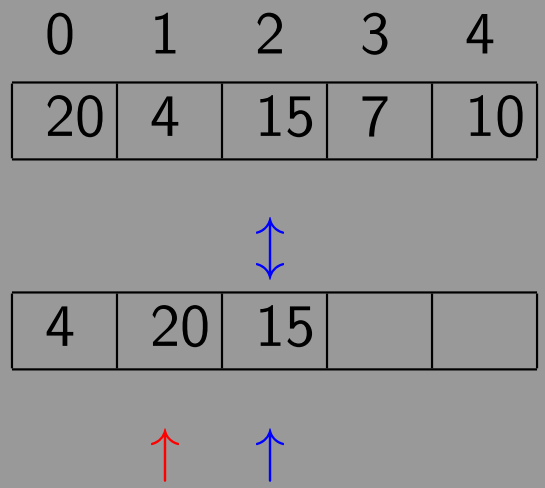
- $i = i + 1$; inicializa $j = i - 1$
- $4 < 20$? Sim
- $j = j - 1$
- acabou vetor

Insertion Sort



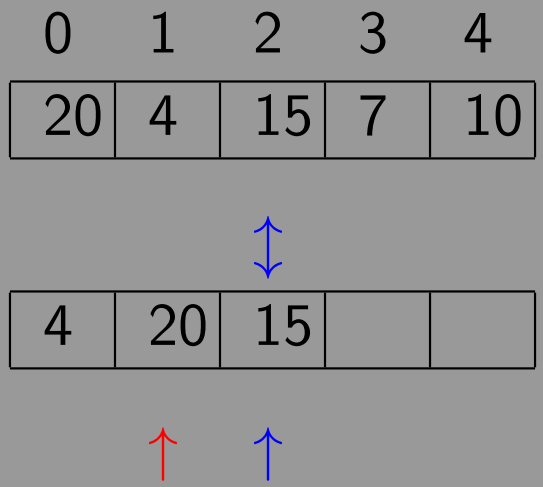
- $i = i + 1$; inicializa $j = i - 1$
- $4 < 20$? Sim
- $j = j - 1$
- acabou vetor
- $swap(vetor[i], vetor[j + 1])$

Insertion Sort



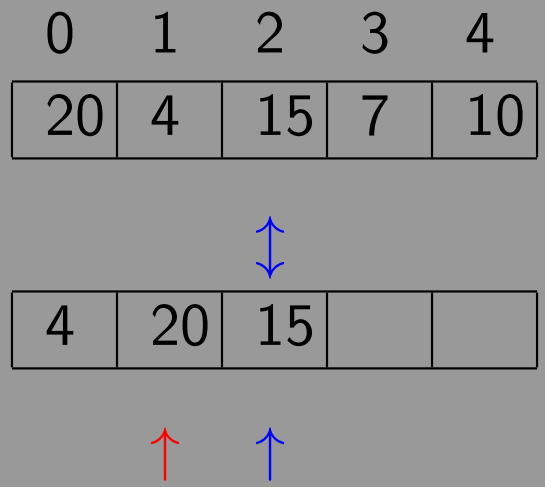
- $i = i + 1$; inicializa $j = i - 1$

Insertion Sort



- $i = i + 1$; inicializa $j = i - 1$
- $15 < 20$? Sim

Insertion Sort



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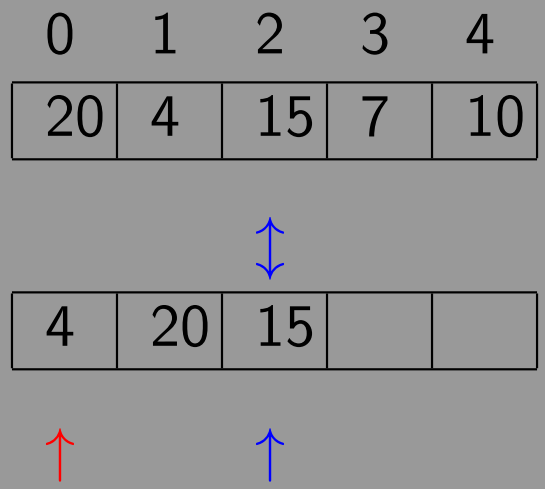

- $15 < 4$? Não

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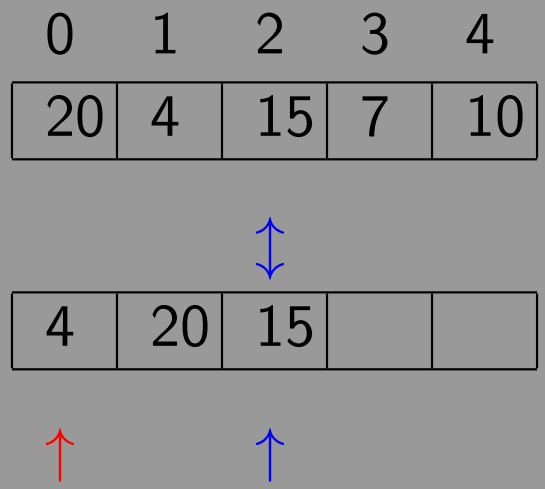

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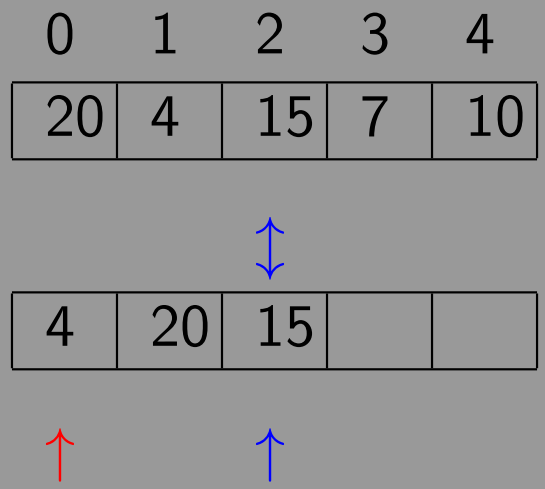

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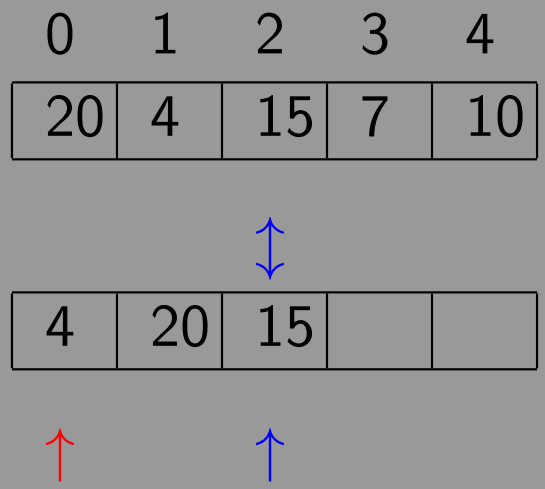
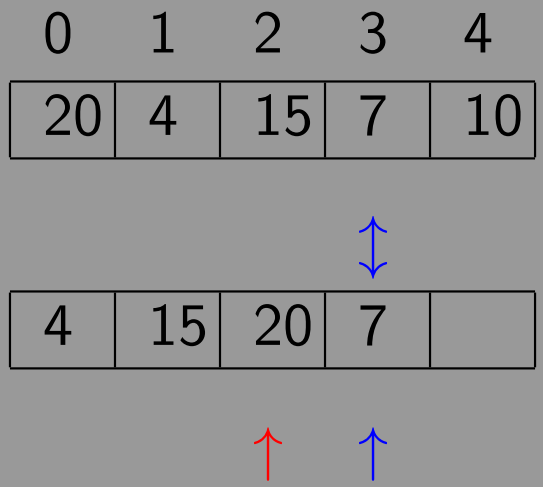


- $15 < 4$? Não
- $j = j - 1$
- acabou vetor
- $swap(vetor[i], vetor[j + 1])$

Insertion Sort



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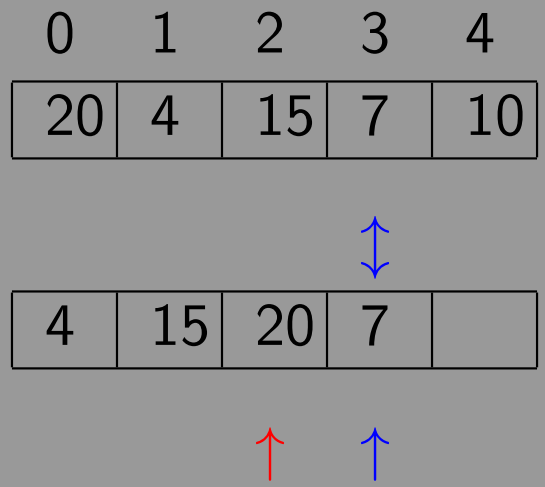
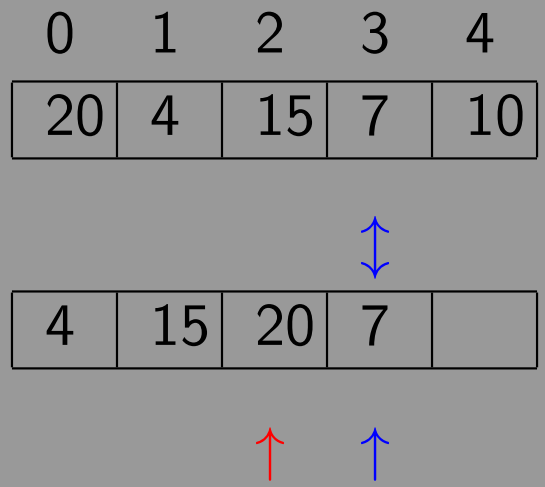
Insertion Sort



- $i = i + 1$; inicializa $j = i - 1$
- $7 < 20$? Sim

Insertion Sort



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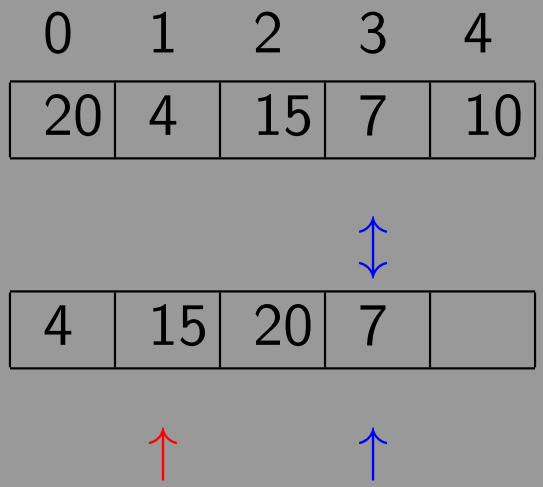

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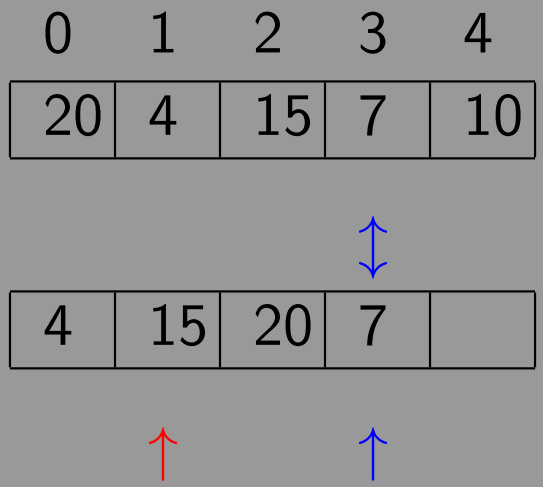

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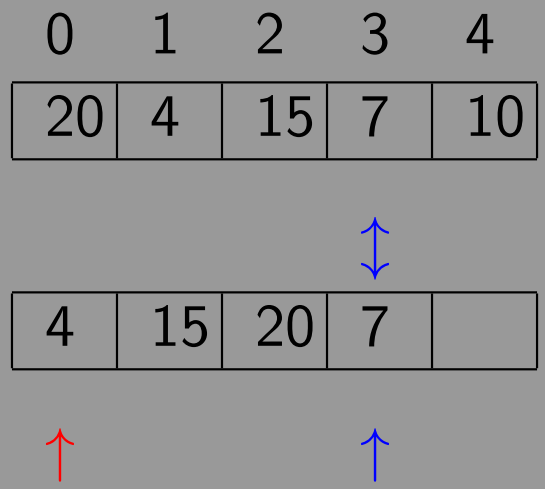

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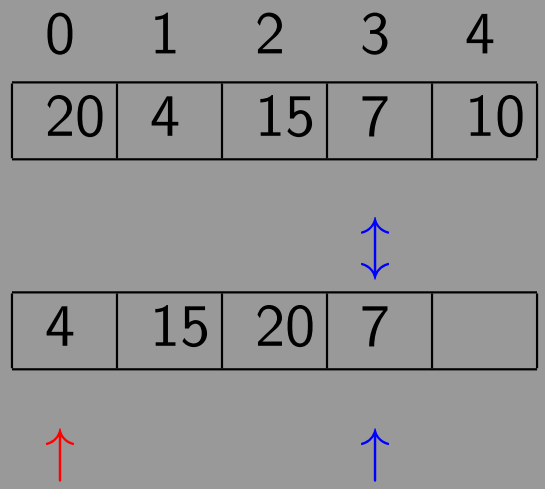

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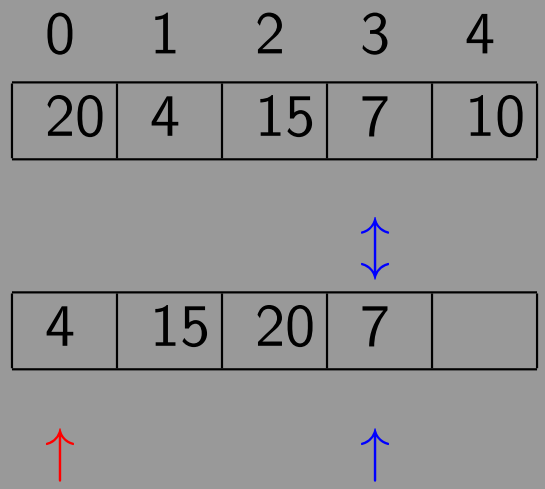

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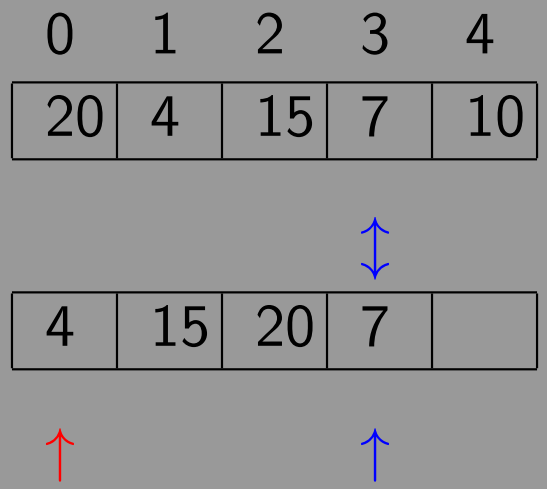

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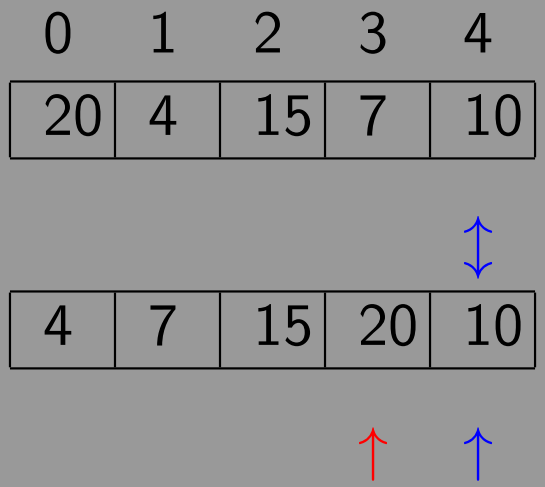
- acabou vetor
- $swap(vetor[i], vetor[j + 1])$

Insertion Sort



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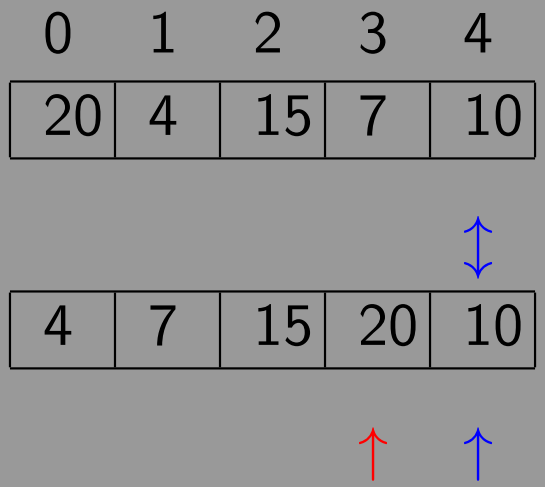

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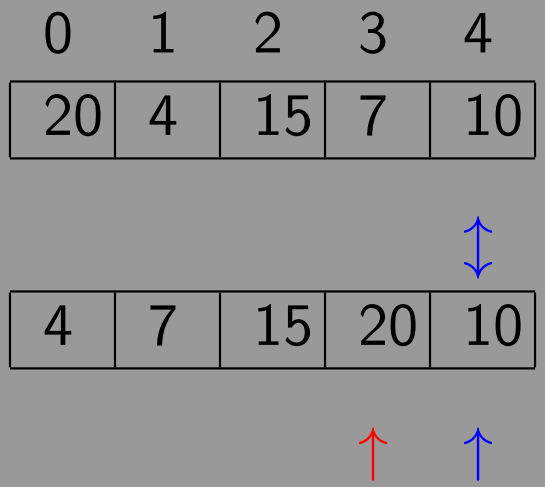
Insertion Sort



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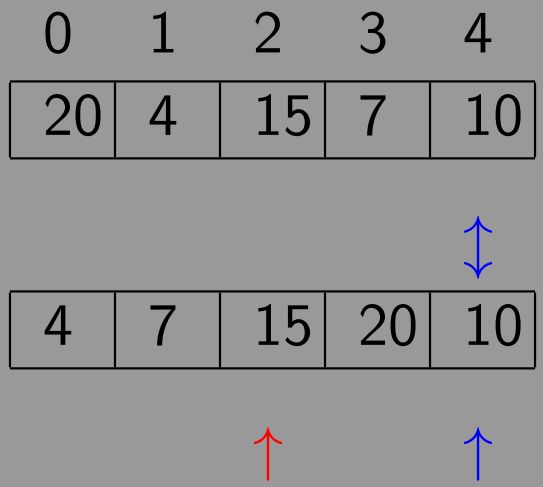

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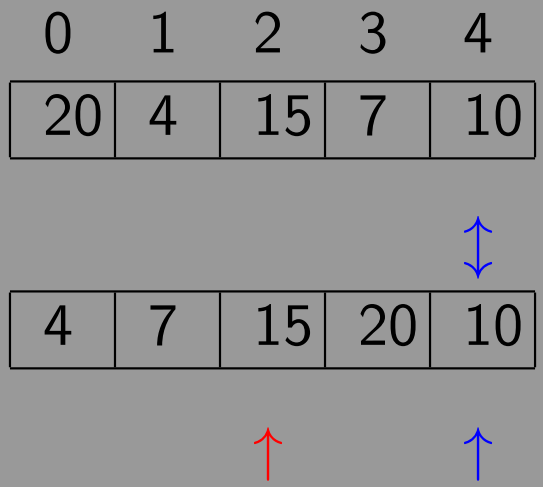
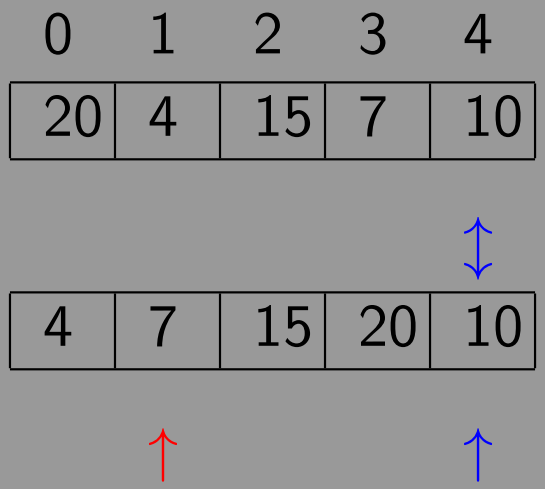


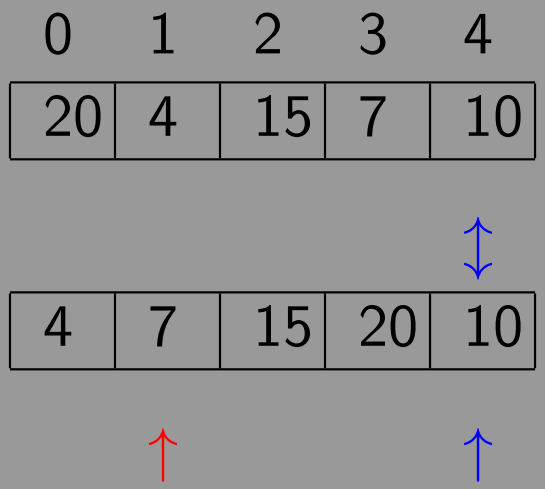
- $10 < 15$? Sim
- $j = j - 1$

Insertion Sort



- $10 < 7$? Não

Insertion Sort



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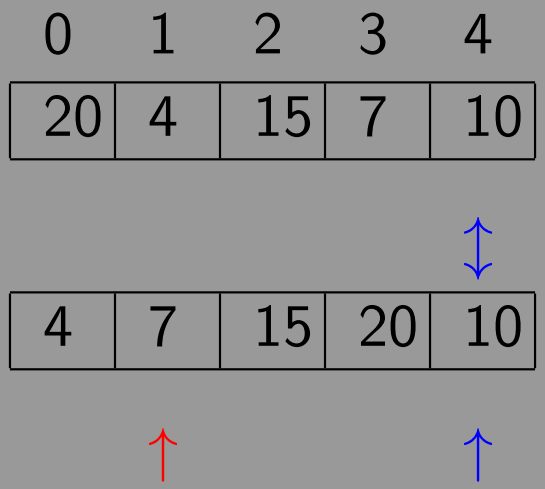
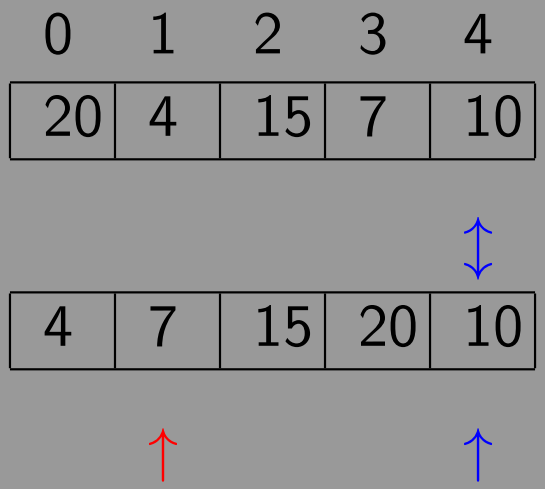


- $10 < 7$? Não
- $j = j - 1$
- acabou vetor, pois não a partir daqui está ordenado.

Insertion Sort



- $10 < 7$? Não
- $j = j - 1$
- acabou vetor, pois não a partir daqui está ordenado.
- $swap(vetor[i], vetor[j + 1])$

Insertion Sort

0	1	2	3	4
20	4	15	7	10

4	7	10	15	20

Acabou! Vetor Auxiliar Ordenado!

Insertion Sort

```
vetor[] = {20, 4, 15, 7, 10}

for (int i = 0; i < array.length; i++)
    int a = array[i]
    for (int j = i - 1; j >= 0 & array[j] > a; j--)
        array[j + 1] = array[j]
        array[j] = a
```

Exercícios

1. Implemente o método de ordenação Selection Sort.
2. Implemente o método de ordenação Insertion Sort.
3. Teste todos os algoritmos em um algoritmo principal

Referências Bibliográficas

1. Cormen, Thomas H., Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein. "Introduction to algorithms second edition." (2001).
2. Tamassia, Roberto, and Michael T. Goodrich. "Estrutura de Dados e Algoritmos em Java." Porto Alegre, Ed. Bookman 4 (2007).
3. Ascencio, Ana Fernanda Gomes, and Graziela Santos de Araújo. "Estruturas de Dados: algoritmos, análise da complexidade e implementações em JAVA e C/C++." São Paulo: Perarson Prentice Halt 3 (2010).