CENG 201 Veri Yapıları 11: Sıralama Algoritmaları

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Hafta 11

Anahat

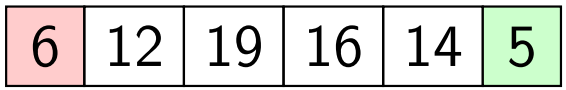
Sıralama Algoritmaları

- Eldeki n adet değeri ya da elemanı mantıksal bir sıraya göre sıralamayı sağlayan algoritmalara *Sıralama Algoritmaları* adı verilir
- Karşılaştırmalı ve karşılaştırmasız türleri bulunmaktadır.
- En yaygın örneği n elemanlı bir dizinin sıralanmasıdır.

- Tüm diziyi arayarak en küçük eleman bulunur ve ilk elemanla yer değiştirilir.
- Kalan dizide(ilk eleman hariç) en küçük eleman bulunur ve dizideki ikinci elemanla yer değiştirilir.
- Bu şekilde dizideki bütün elemanlar uygun sıraya gelene kadar işleme devam edilir.

Seçmeli Sıralama Örneği

i=0



Seçmeli Sıralama Örneği

i=0

6	12	19	16	14	5

i=1

5	12	19	16	14	6

Seçmeli Sıralama Örneği

i=0

6	12	19	16	14	5

i=1

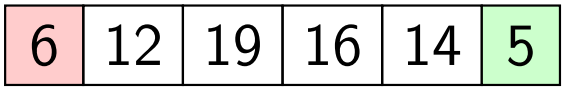
5	12	19	16	14	6

i=2

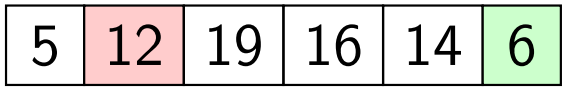
5	6	19	16	14	12

Seçmeli Sıralama Örneği

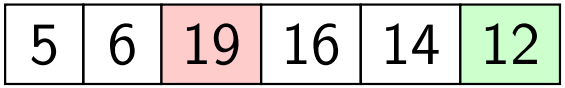
i=0



i=1



i=2



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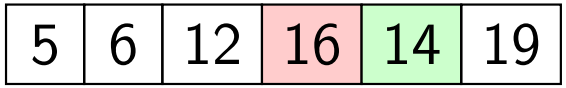


Seçmeli Sıralama Örneği

i=0

6	12	19	16	14	5

i=1

5	12	19	16	14	6

i=2

5	6	19	16	14	12

i=3

5	6	12	16	14	19

i=4

5	6	12	14	16	19

Seçmeli Sıralama Örneği

i=0

6	12	19	16	14	5

i=1

5	12	19	16	14	6

i=2

5	6	19	16	14	12

i=3

5	6	12	16	14	19

i=4

5	6	12	14	16	19

sıralanmış dizi

5	6	12	14	16	19

Seçmeli Sıralama Kodu

```
1  void sort(int arr[])
2  {
3      int n = arr.length;
4      // One by one move boundary of unsorted subarray
5      for (int i = 0; i < n-1; i++)
6      {
7          // Find the minimum element in unsorted array
8          int min_idx = i;
9          for (int j = i+1; j < n; j++)
10             if (arr[j] < arr[min_idx])
11                 min_idx = j;
12         // Swap the found minimum element with the first
13         // element
14         int temp = arr[min_idx];
15         arr[min_idx] = arr[i];
16         arr[i] = temp;
17     }
18 }
```

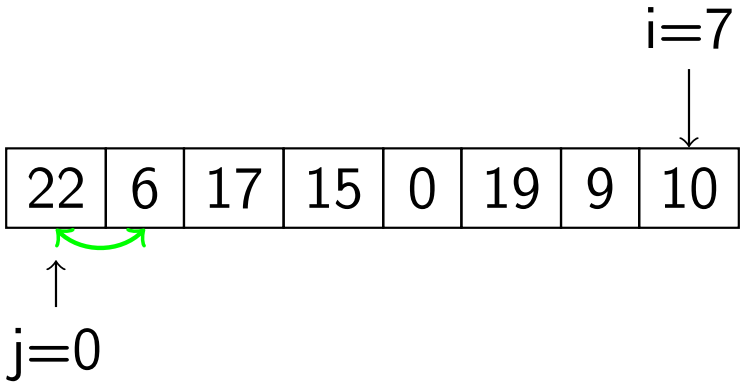
- En kötü durumda kaç karşılaştırma yapılır?

```
n*(n-1)/2
```

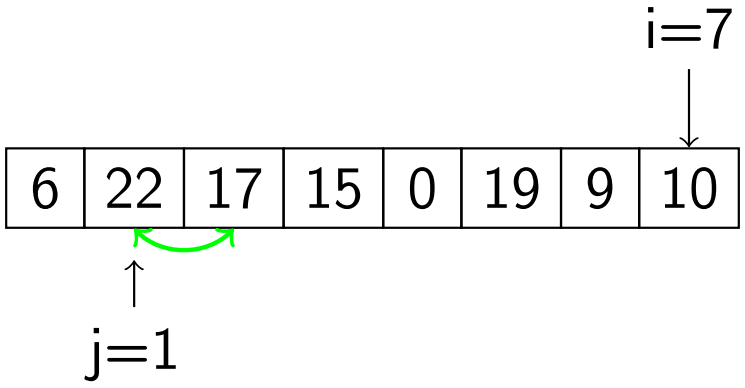
Kabarcık Sıralama

- Baştan sona doğru elemanlar ikili olarak(komşusuyla birlikte) birer kabarcık olarak düşünülür.
- Kabarcık içindeki elemanlar karşılaştırılır ve sıralanır.
- İlk turun sonunda en büyük eleman en sona yerleşmiş olur.
- Bu işlem $n - 1$ defa yapıldığında dizi sıralanmış olur.

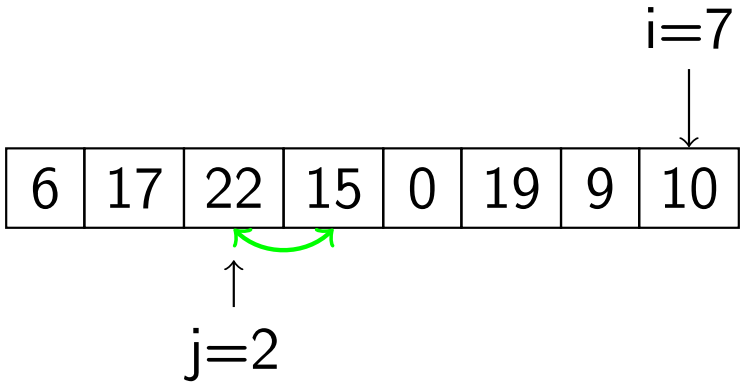
Kabarcık Sıralama Örneği



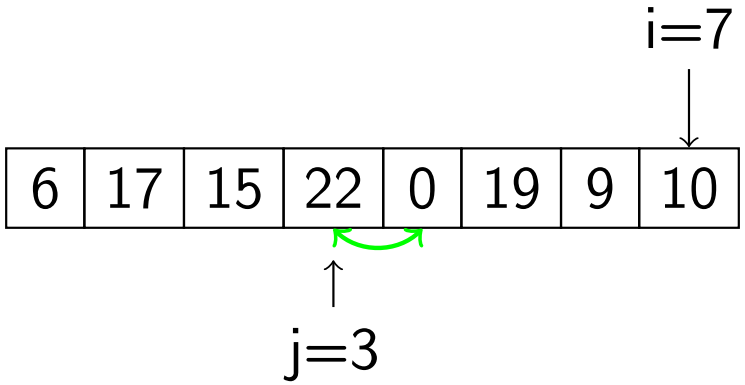
Kabarcık Sıralama Örneği



Kabarcık Sıralama Örneği



Kabarcık Sıralama Örneği



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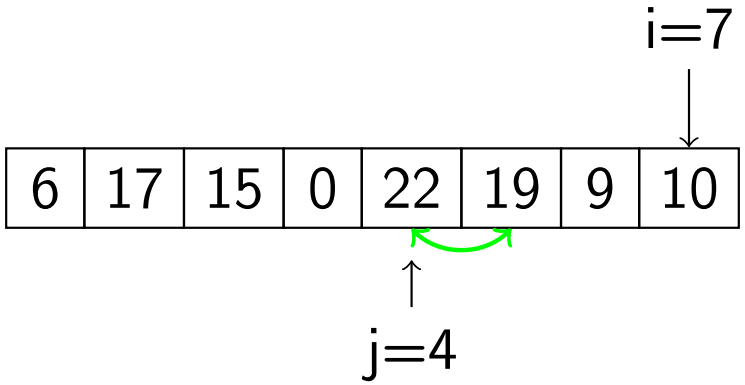

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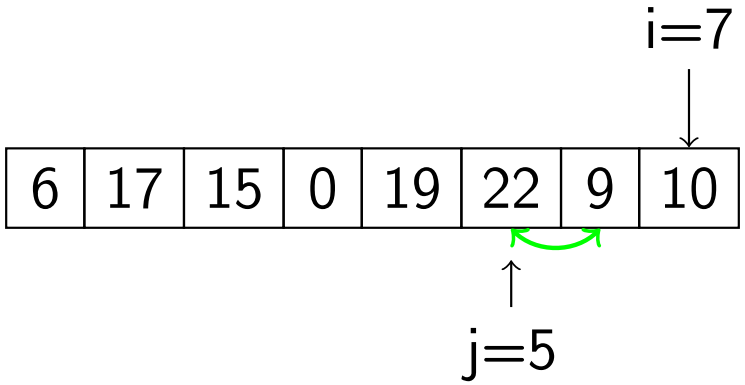

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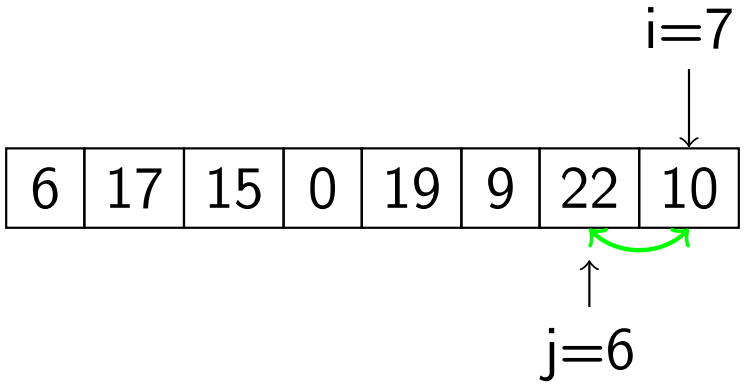

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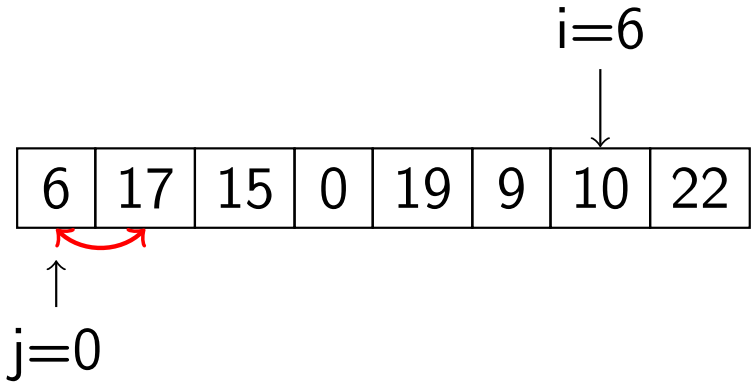

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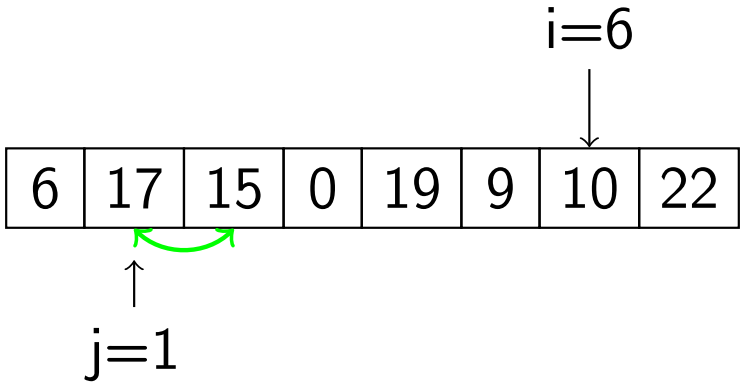

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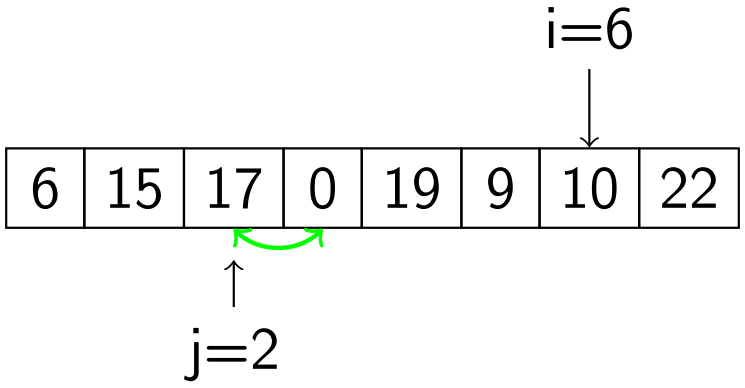

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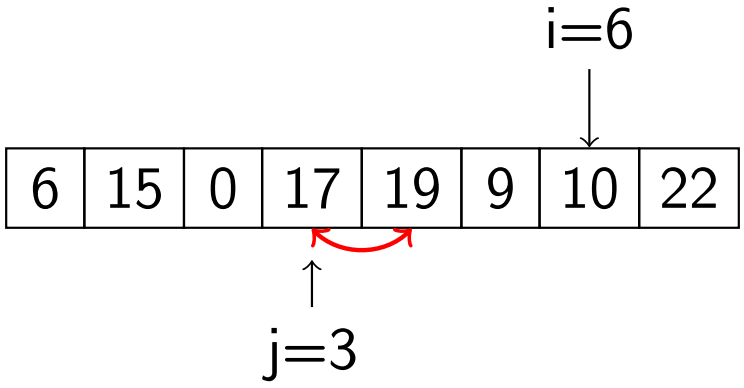

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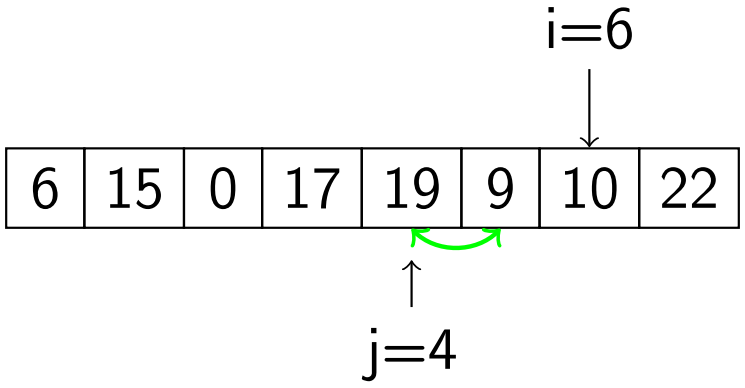

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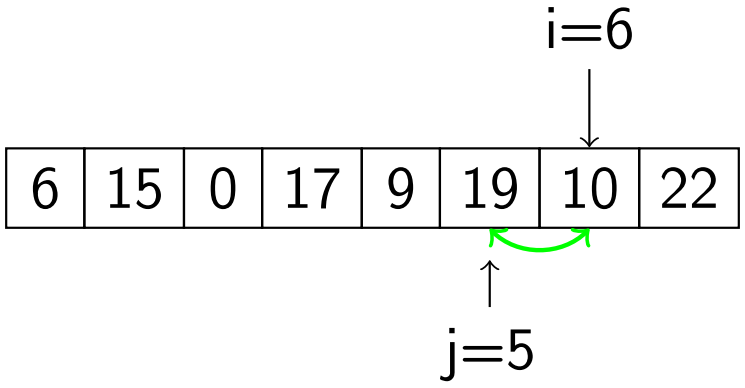

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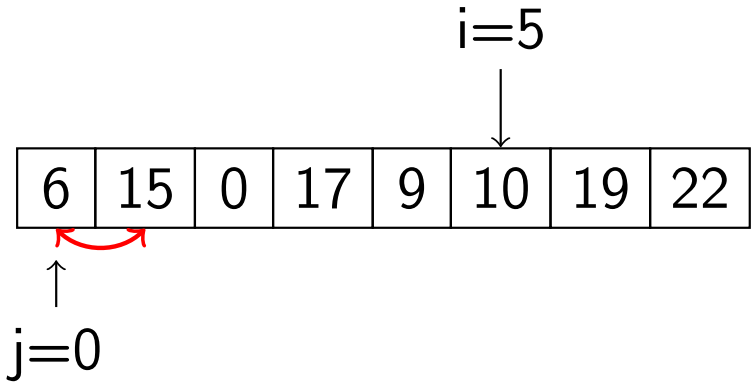

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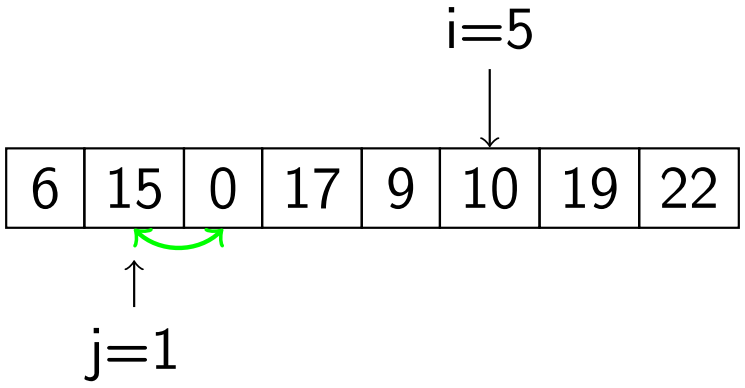

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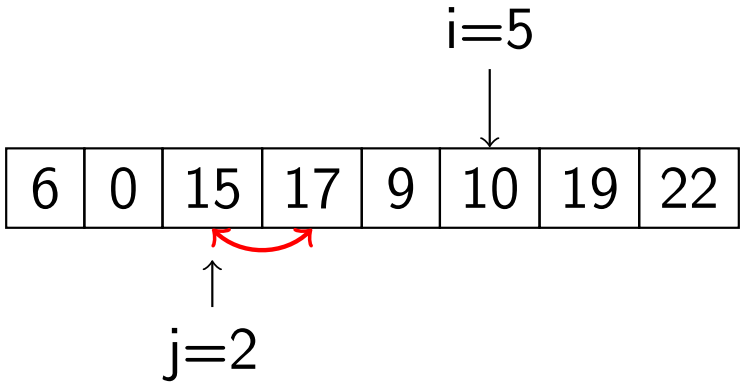

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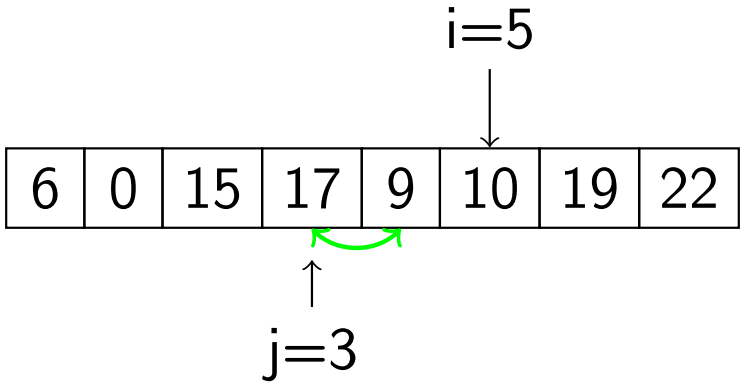

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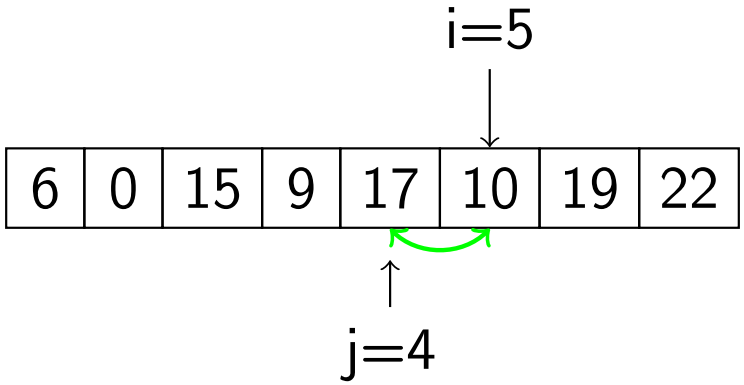

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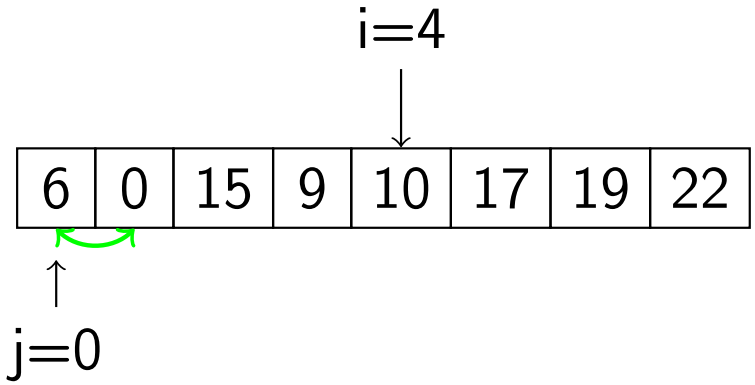

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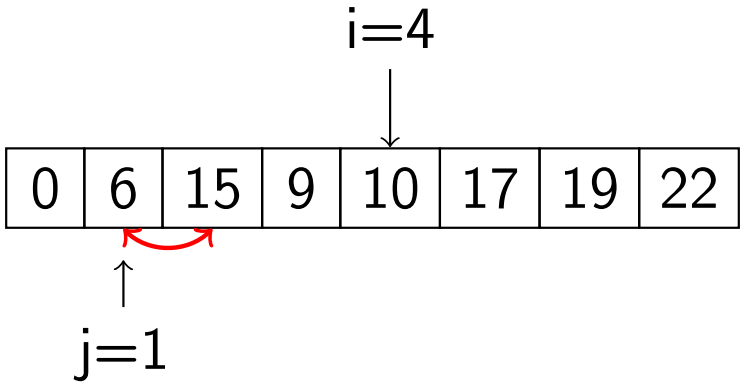

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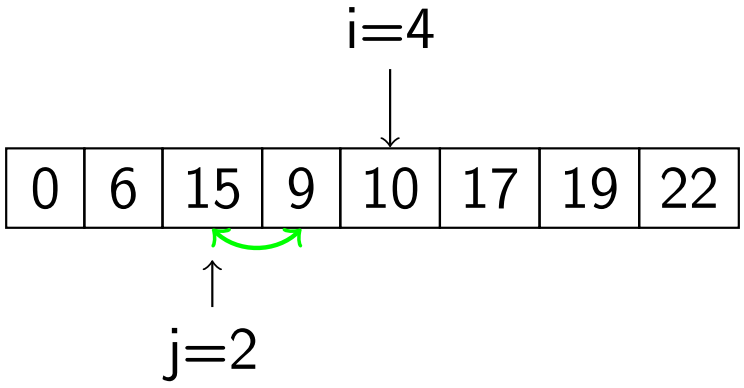

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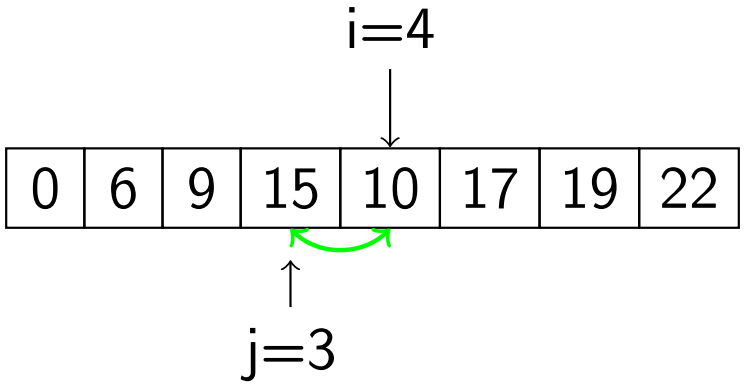

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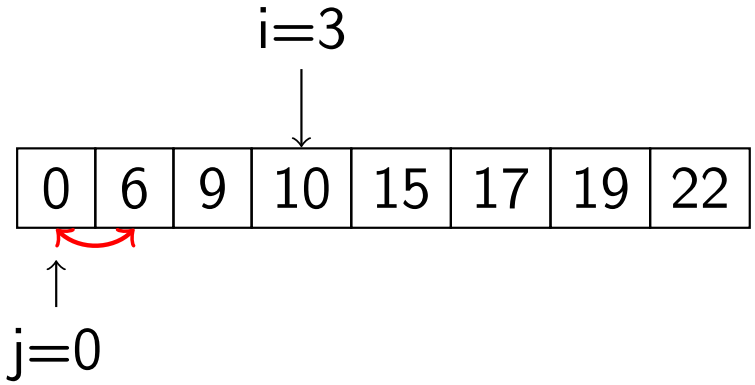

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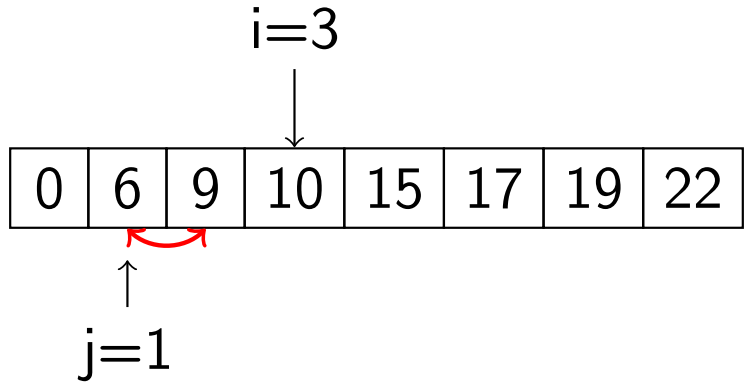

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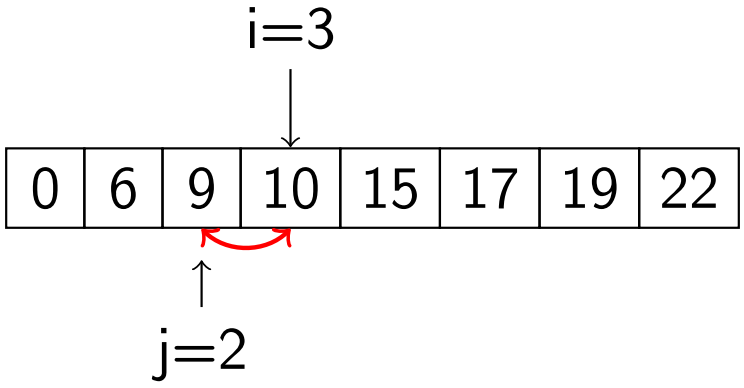

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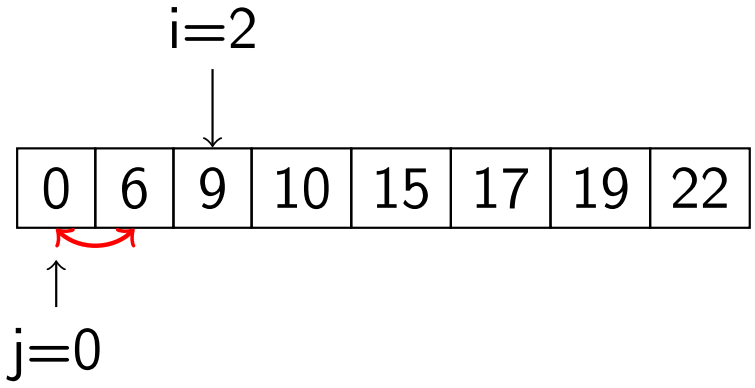

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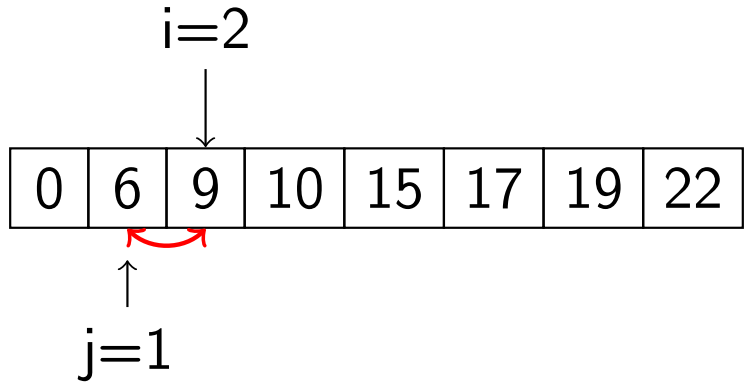

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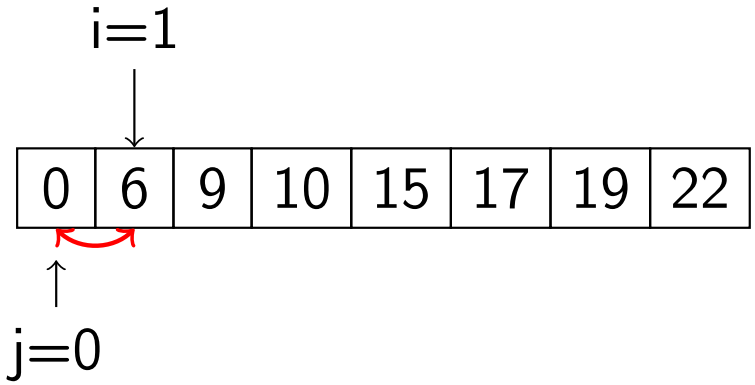


Kabarcık Sıralama Kodu

n*(n-1)/2

```
1  void bubbleSort(int arr[])
2  {
3      int n = arr.length;
4      for (int i = 0; i < n-1; i++)
5          for (int j = 0; j < n-i-1; j++)
6              if (arr[j] > arr[j+1])
7              {
8                  // swap arr[j+1] and arr[i]
9                  int temp = arr[j];
10                 arr[j] = arr[j+1];
11                 arr[j+1] = temp;
12             }
13 }
```

Kabarcık Sıralama Geliştirme

- Geliştirme uygulanabilir mi?

Kabarcık Sıralama Geliştirme

- Geliştirme uygulanabilir mi?
- Eğer son turda hiç bir yer değiştirme olmadıysa dizi sıralanmış demektir. Algoritma sonlandırılabilir.

- En kötü durumda kaç karşılaştırma yapılır?

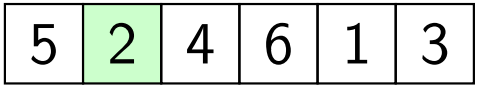
```
n*(n-1)/2
```

Eklemeli Sıralama

- İskambil kağıtlarını dizmeye benzerdir.
- Dizinin bir tarafı sıralanmış olarak kabul edilir.
- Sıralı olmayan bir kısımdan eleman seçilip sıralı olan kısımdaki uygun konumuna yerleştirilir.
- Bütün elemanlar sıralı kısıma gelene kadar işlemler devam ettirilir.

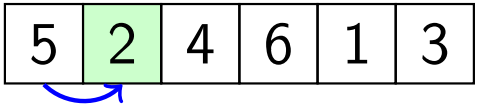
Eklemeli Sıralama Örneği

j=1

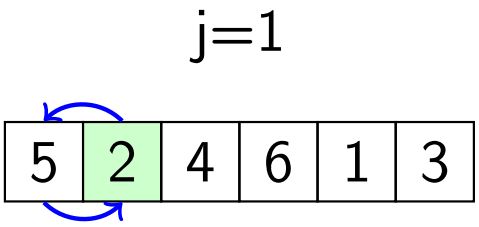


Eklemeli Sıralama Örneği

j=1

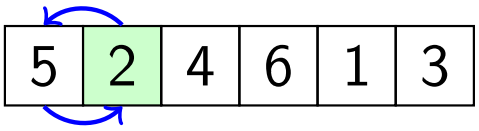


Eklemeli Sıralama Örneği

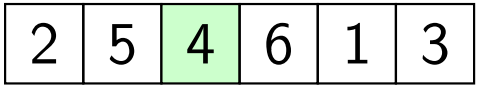


Eklemeli Sıralama Örneği

j=1

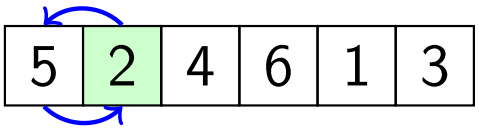


j=2



Eklemeli Sıralama Örneği

j=1



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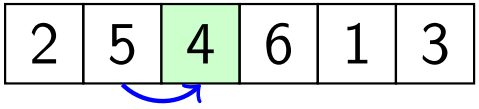

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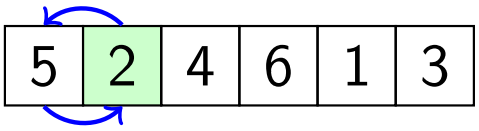

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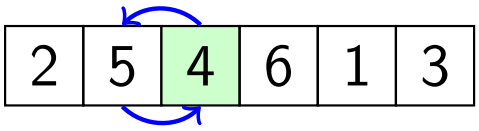

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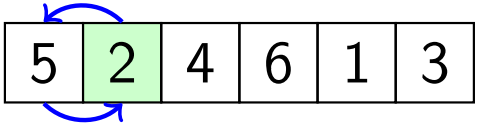

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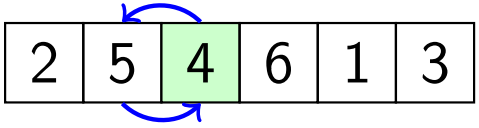

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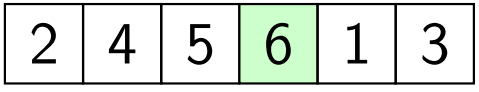

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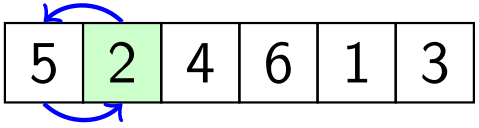

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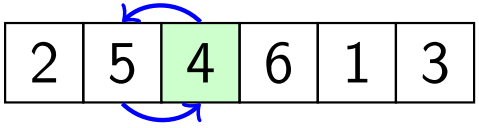

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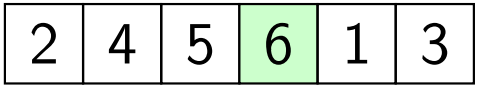

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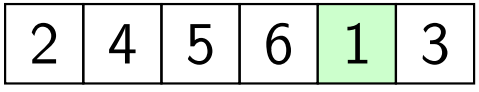

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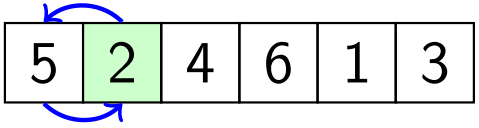

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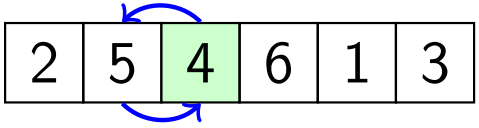

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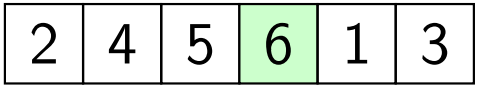

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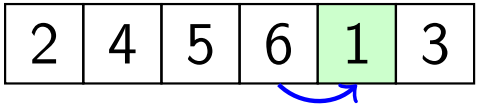

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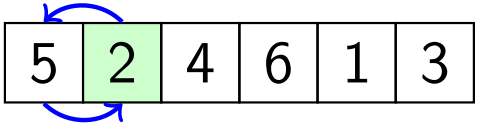

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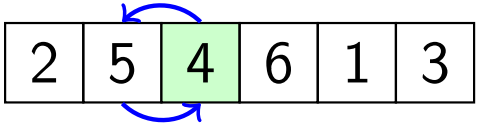

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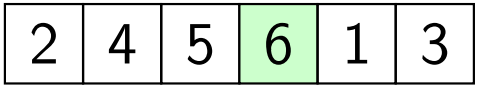

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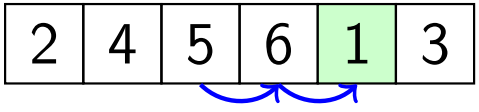

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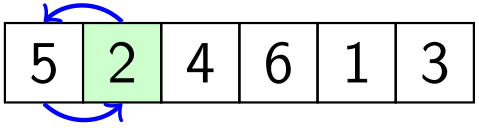

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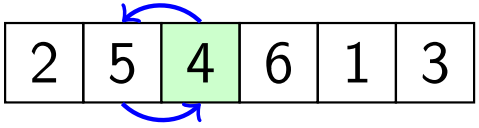

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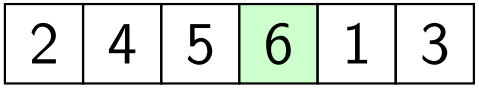

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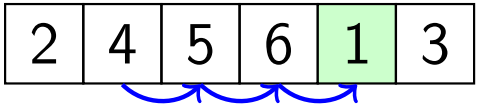

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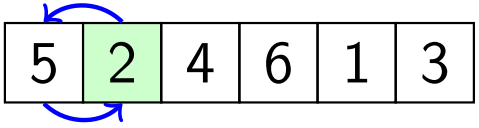

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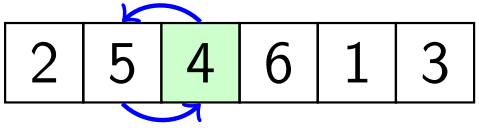

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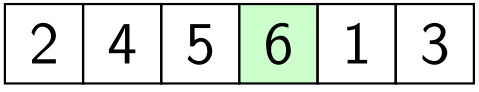

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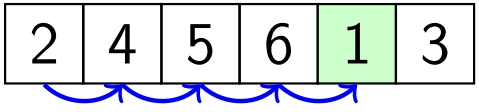

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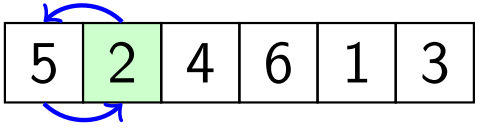

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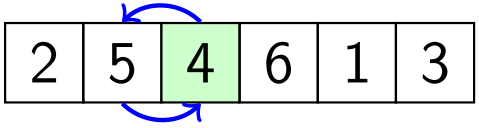

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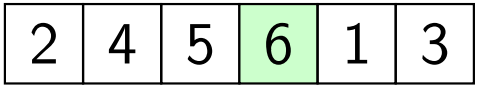

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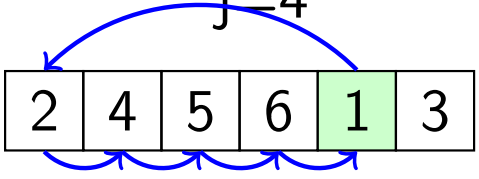

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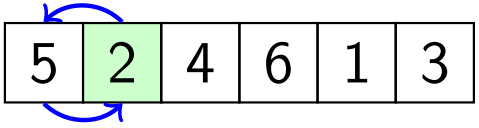

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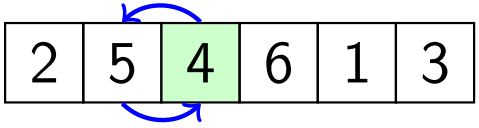

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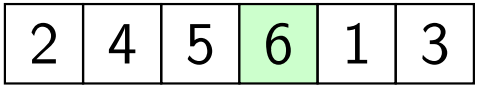

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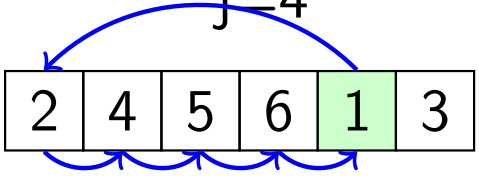

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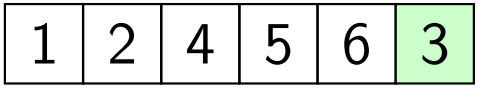

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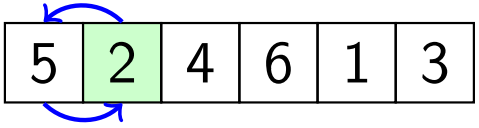

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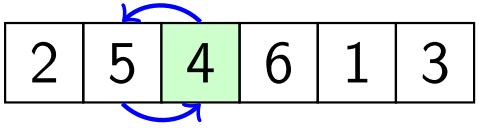

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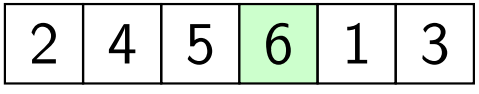

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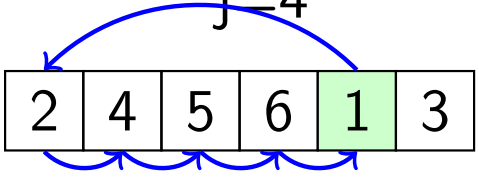

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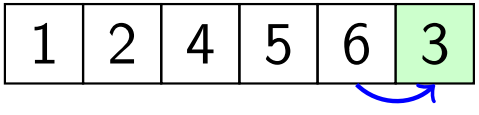

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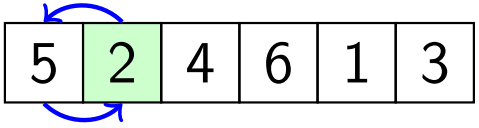

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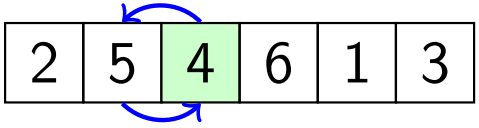

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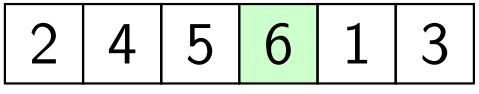

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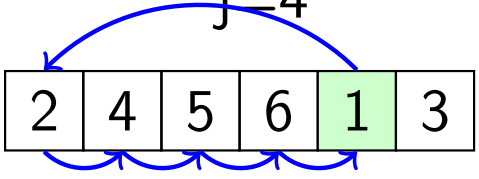

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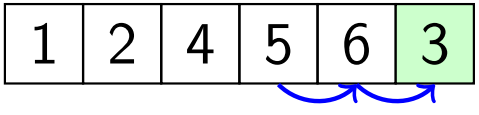

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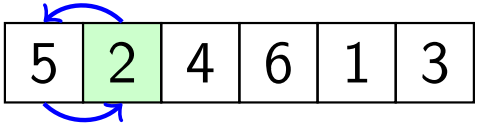

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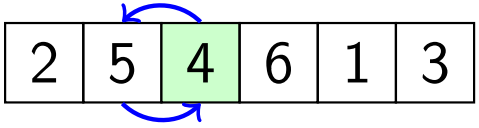

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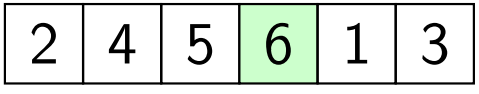

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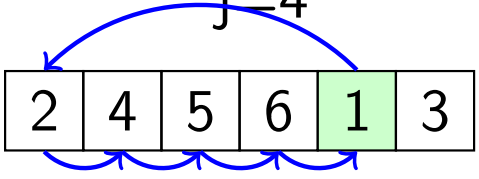

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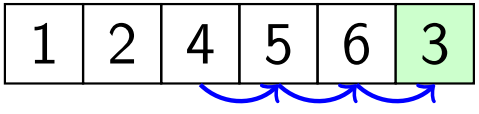
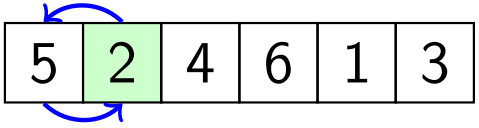


Eklemeli Sıralama Örneği

j=1



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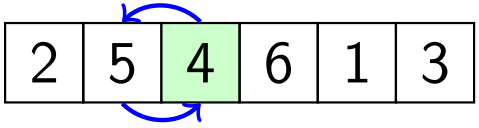
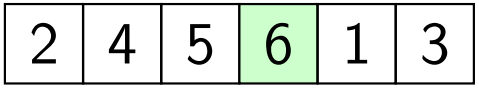
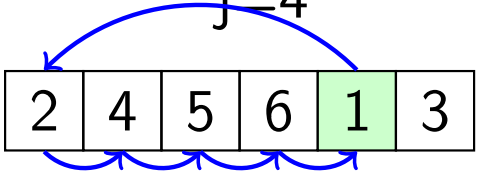


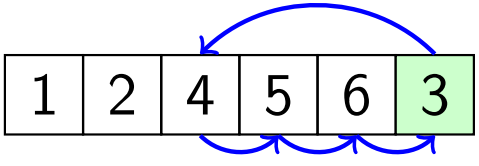
j=3



j=4



j=5



Eklemeli Sıralama Örneği

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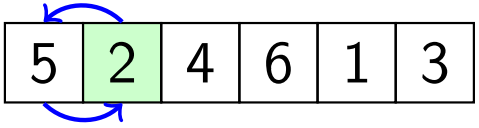
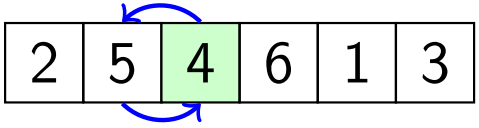
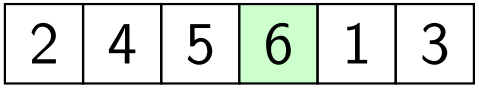


j=2



j=3



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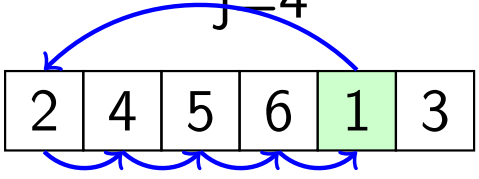
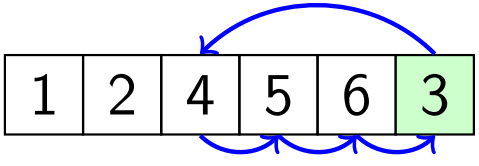
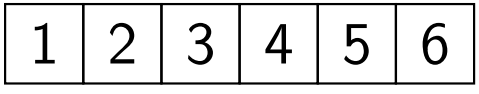


j=5



sıralanmış dizi



Eklemeli Sıralama Kod

```
1  void sort(int arr[])
2  {
3      int n = arr.length;
4      for (int i=1; i<n; ++i)
5      {
6          int key = arr[i];
7          int j = i-1;
8          /* Move elements of arr[0..i-1], that are
9             greater than key, to one position ahead
10            of their current position */
11         while (j>=0 && arr[j] > key)
12         {
13             arr[j+1] = arr[j];
14             j = j-1;
15         }
16         arr[j+1] = key;
17     }
18 }
```

- En kötü durumda kaç karşılaştırma yapılır?

```
n*(n-1)/2
```

Algoritma Karmaşıklıkları

Algoritma	**Karmaşıklık**
Seçmeli Sıralama	$O(n^2)$
Kabarcık Sıralama	$O(n^2)$
Eklemeli Sıralama	$O(n^2)$

Sıralama Algoritmaları Bağlantıları

- Animasyonlu web sitesi
- YouTube Yöresel Danslar
- Görselleştirme