Algorithm

1주차: 정렬 알고리즘

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정렬 알고리즘

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Stooge Sort
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Odd-Even Sort / Brick Sort
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Merge Sort for Doubly Linked List
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왜 배워야 하는가?

1. 알고리즘 설계 / 디자인 하는 법을 배움
2. 실제 정렬을 해야 하는 데이터에 따라 유리한 정렬 알고리즘이 다름
3. 코딩테스트의 문제를 풀 때 가장 기초가 되는 것이 정렬임

정렬 알고리즘의 성능 측정

O(1)

```
printf("Hello");
```

O(n)

```
for (i=0; i<n; i++)
{
  printf("Hello");
}
```

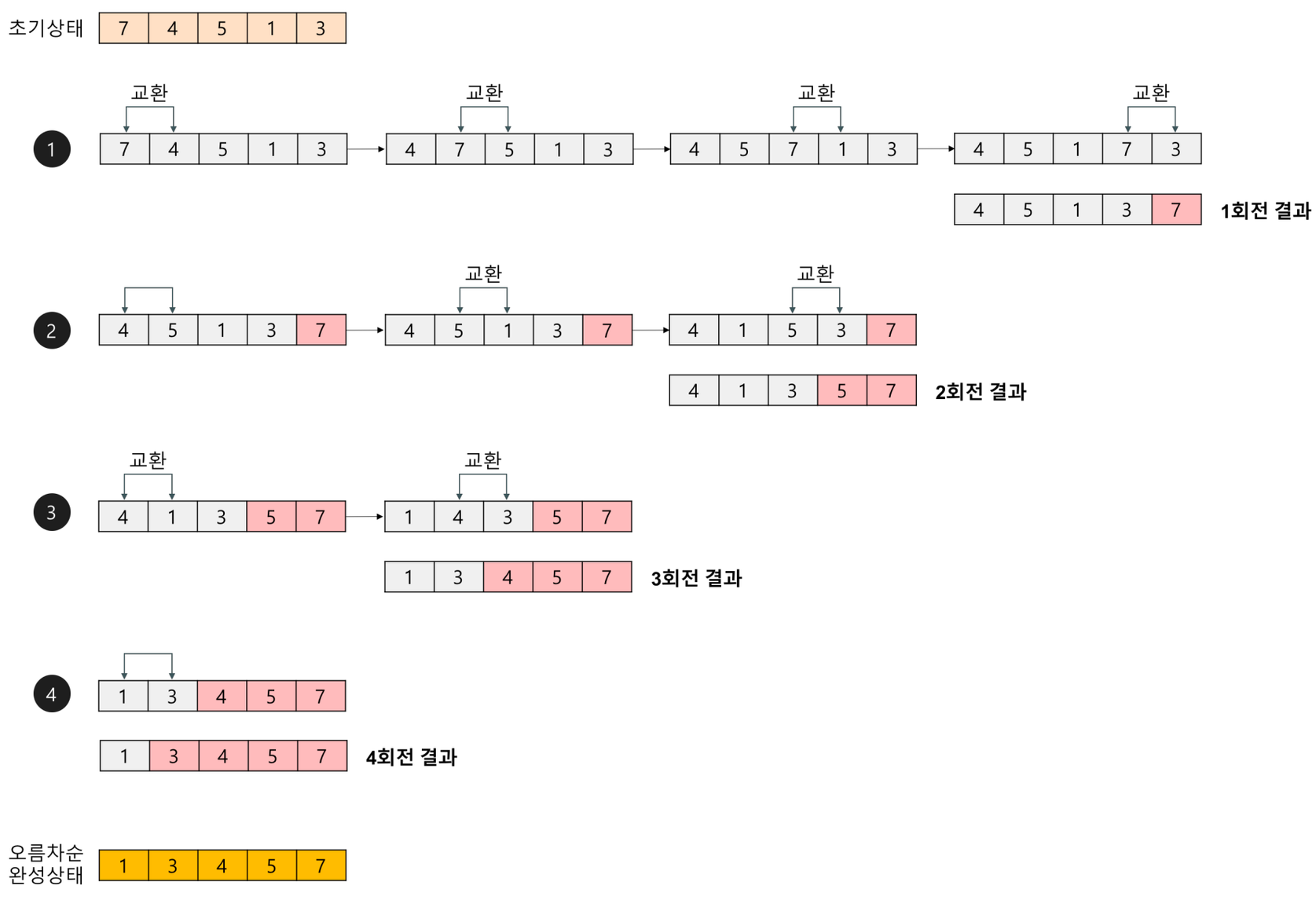
O(n²)

```
for (i=0; i<n; i++)
{
 for (j=0; j<n; j++)
 {
   printf("Hello");
 }
}
```

3. Bubble Sort

가장 간단한 정렬 방법

핵심 전략: Swap



최적화한 Bubble Sort

최적화 전

```c
for (i=0; i<n; i++)
{
  for (j=0; j<n-1; j++)
  {
    if (arr[j] > arr[j+1])
    {
      swap(&arr[j], &arr[j+1]);
    }
  }
}
```

최적화 후

```c
for (i=0; i<n; i++)
{
  for (j=0; j<n-i; j++)
  {
    if (arr[j] > arr[j+1])
    {
      swap(&arr[j], &arr[j+1]);
    }
  }
}
```

4. Selection Sort

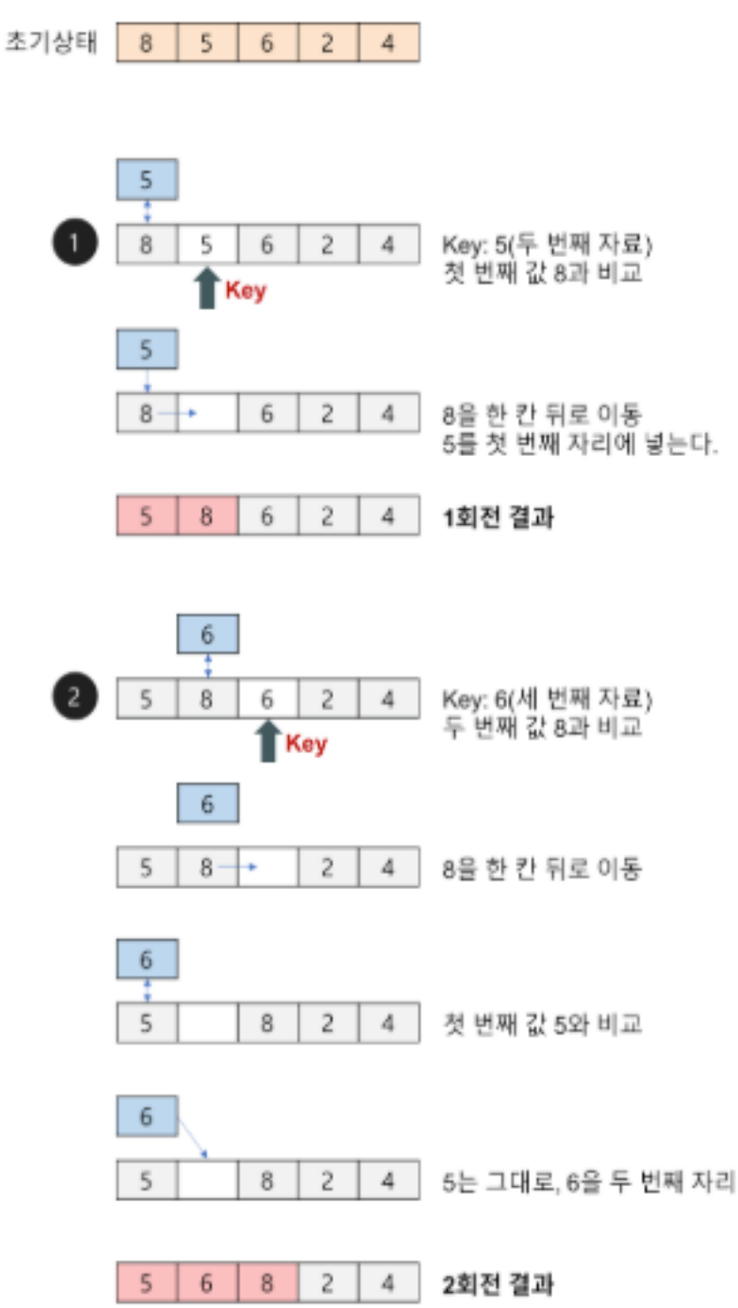
최대 / 최소값을 Select

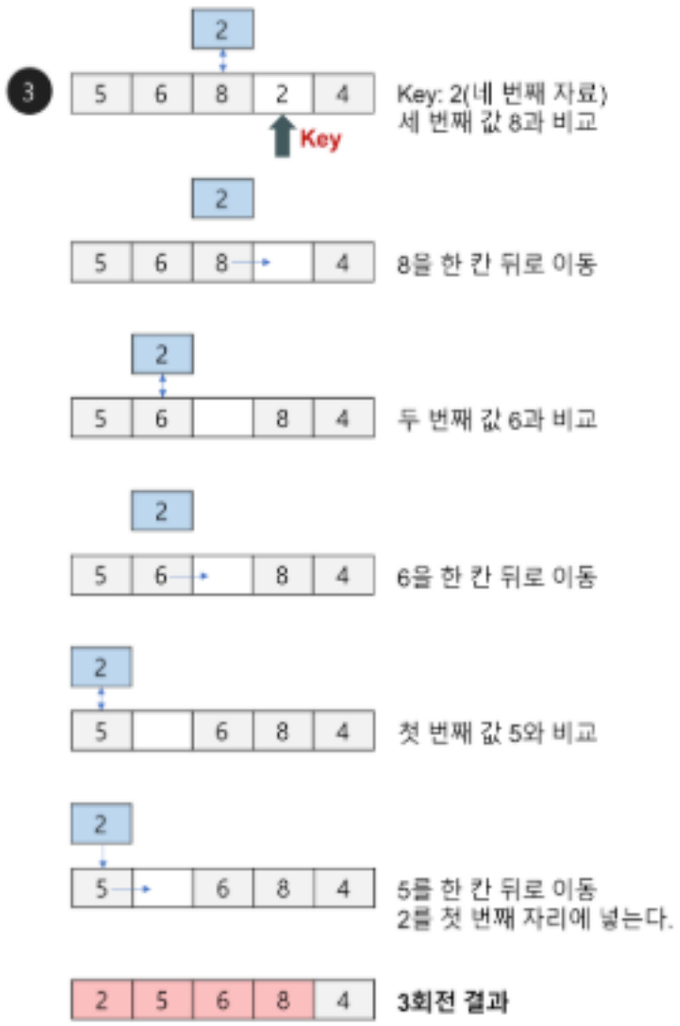
핵심 전략: Select

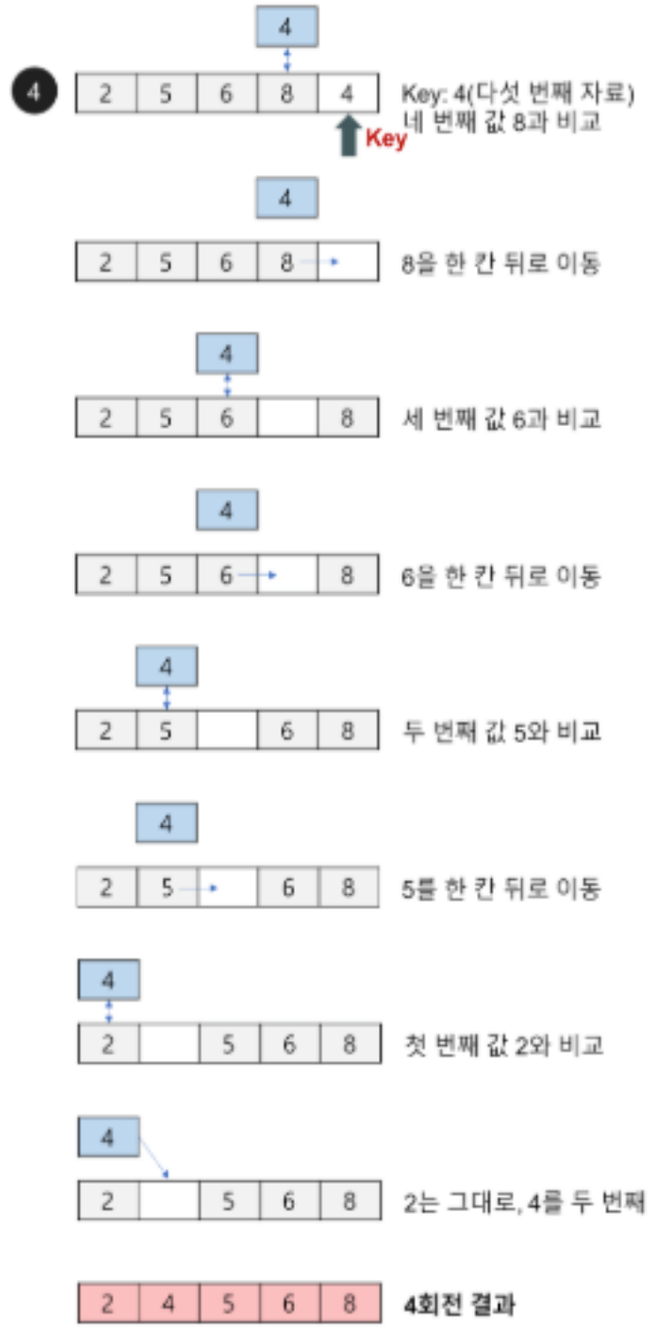
5. Insertion Sort

자기 위치를 찾아서 Insert

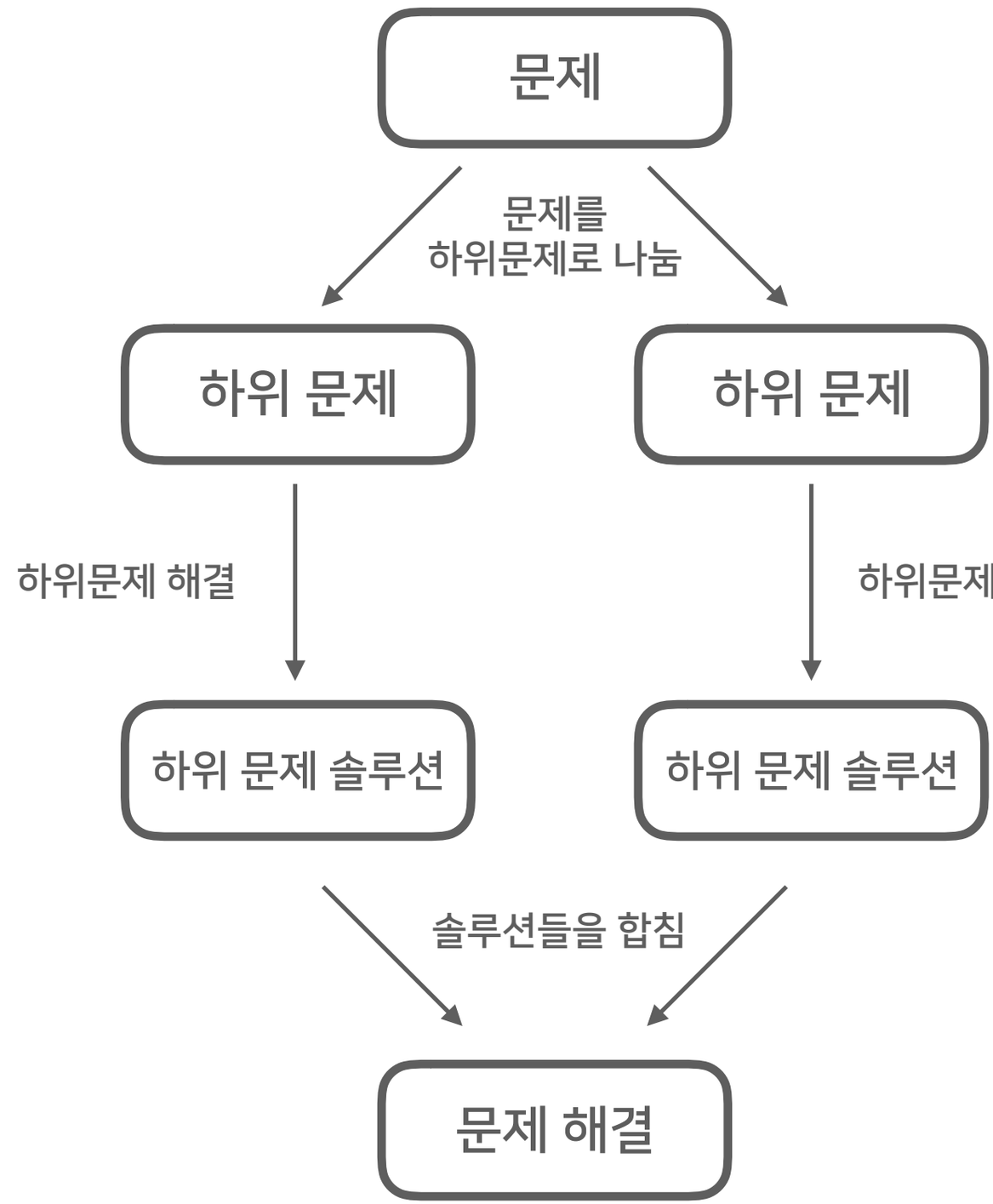
핵심 전략: Insert







재귀적으로 문제를 나눔



문제: A의 B승 계산

정수 A와 B를 입력받고 A의 B승을 계산하여 출력 하시오.

입력 예시1:
2 11

출력 예시1:
2048

입력 예시2:
5 10

출력 예시2:
9765625

해답: A의 B승 계산

```
for (i=0; i<B; i++)
{
  answer *= A;
}
```

O(n)

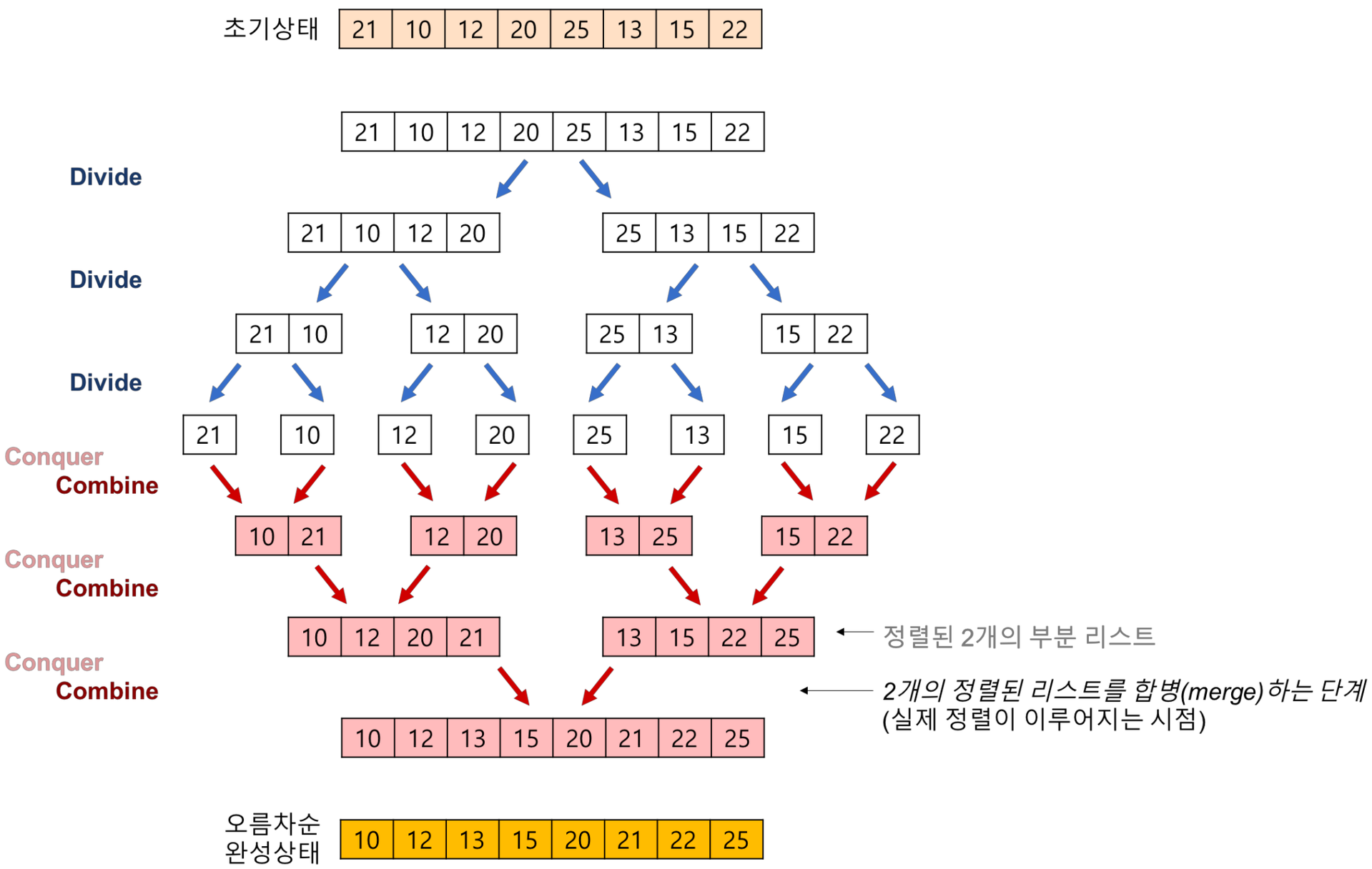
```
int power(int A, int B)
{
    int tmp;

    if (B == 0) return 1;

    tmp = power(A, B/2);

    if (B % 2 == 0) return tmp * tmp;
    else return A * tmp * tmp;
}
```

O(logn)

7. Merge Sort

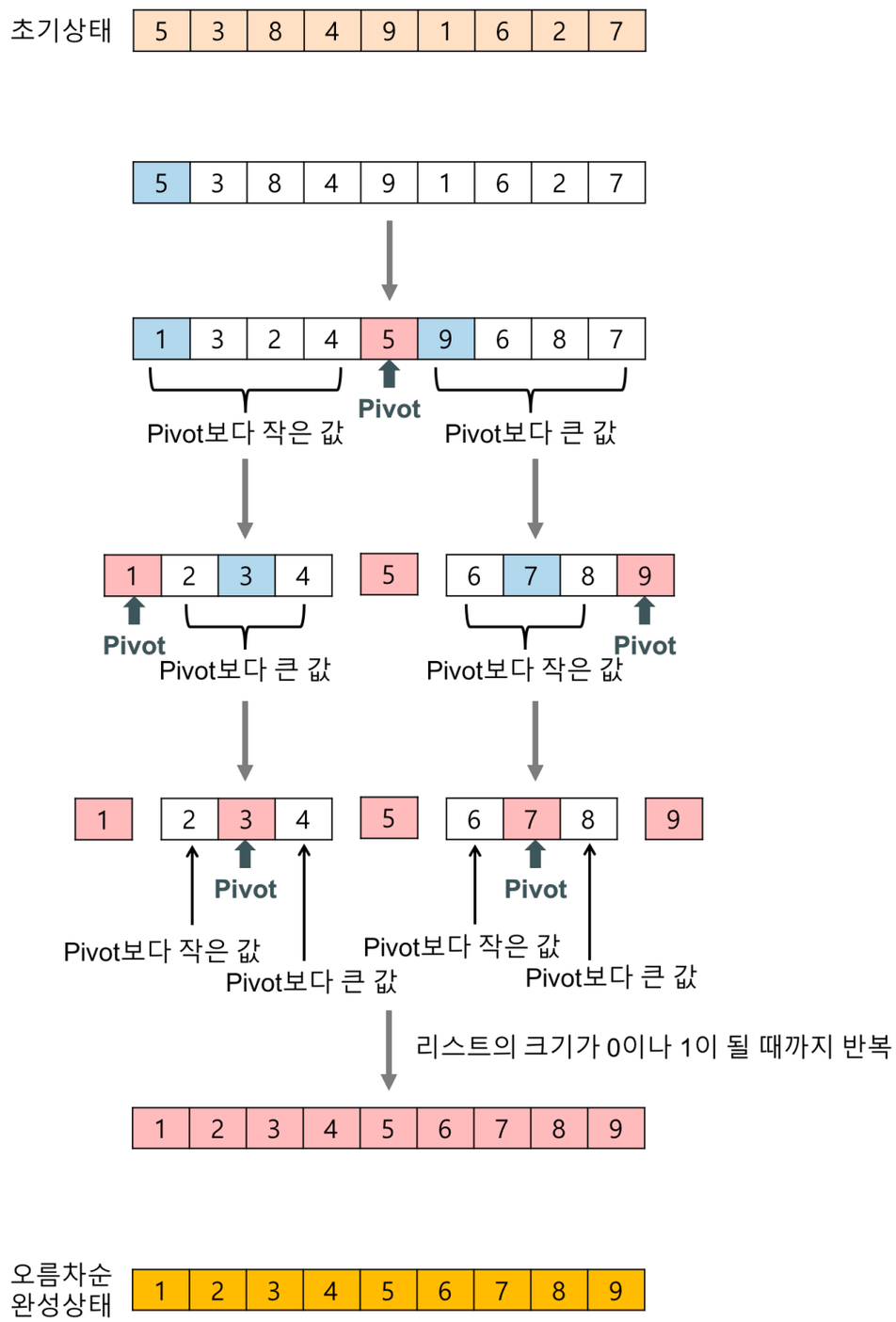
잘게 나눴다가 합치면서 정렬

핵심 전략: Divide and Conquer



Pivot 값을 기준으로 나눔

핵심 전략: Divide and Conquer

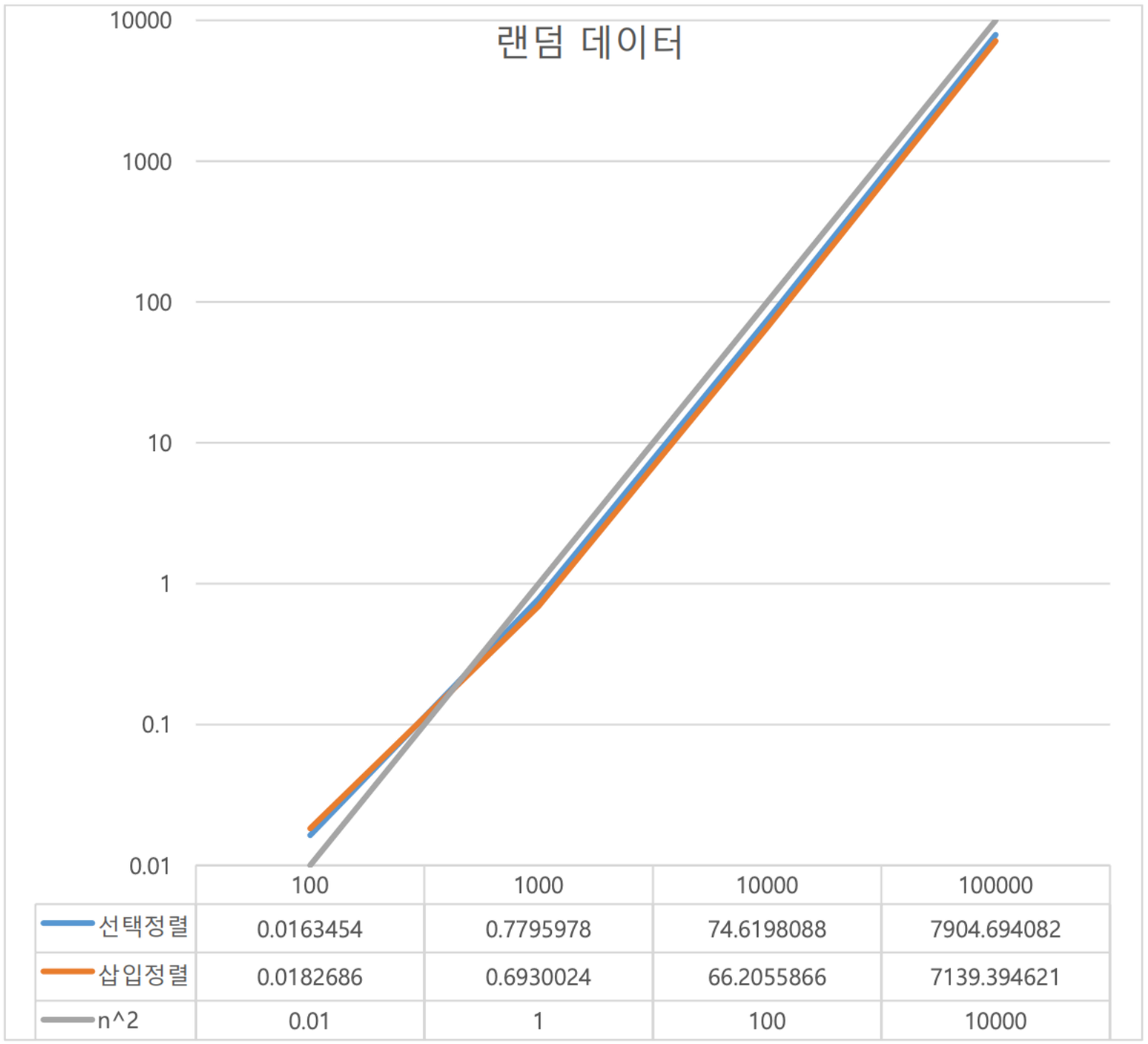


9. 요약

최선, 최악, 평균 비교

	Best	Worst	Average
Bubble Sort	$O(n^2)$	$O(n^2)$	$O(n^2)$
Selection Sort	$O(n^2)$	$O(n^2)$	$O(n^2)$
Insertion Sort	$O(n)$	$O(n^2)$	$O(n^2)$
Merge Sort	$O(nlogn)$	$O(nlogn)$	$O(nlogn)$
Quick Sort	$O(nlogn)$	$O(n^2)$	$O(nlogn)$

과제 예시



	100	1000	10000	100000
선택정렬	0.0163454	0.7795978	74.6198088	7904.694082
삽입정렬	0.0182686	0.6930024	66.2055866	7139.394621
n^2	0.01	1	100	10000

11. References

https://gmlwjd9405.github.io/2018/05/06/algorithm-bubble-sort.html

https://www.geeksforgeeks.org/analysis-of-different-sorting-techniques/

https://www.geeksforgeeks.org/divide-and-conquer/