

이진 탐색 (Binary Search)

※ Data가 정렬이 되어 있어야 한다!

Algorithm,, Search

- 일반적 구현

```
public static int binarySearch(int[] arr, int target) {
    int left = 0;
    int right = arr.length - 1;
    int mid = 0;
    while(left <= right) {
        mid = (left + right) / 2;
        if(arr[mid] < target)
            left = mid + 1;
        else if (arr[mid] > target)
            right = mid - 1;
        else
            return mid;
    }
    return Integer.MIN_VALUE;
}
```

- 재귀적 구현

```
public static int binarySearchRecursive(int[] arr, int target, int left,
int right) {
    if(left > right)
        return Integer.MIN_VALUE;
    int mid = (left + right) / 2;
    if(arr[mid] < target)
        return binarySearchRecursive(arr, target, left + 1, right);
    else if (arr[mid] > target)
        return binarySearchRecursive(arr, target, left, right - 1);
    else
        return mid;
}
```

- $A \leq X \leq B$ 조건을 검색. (반환값이 index+1 이므로)

```
public static int binarySearch(ArrayList<Integer> list, int target) {

    int left = 0;
    int right = list.size() - 1;
```

```
int middle = 0;
while(left <= right) {
    middle = (left + right) / 2;
    if(target < list.get(middle)) {
        right = middle - 1;
    }
    else {
        left = middle + 1;
    }

    if(list.get(middle) <= target && middle < list.size() - 1) {
        if(target < list.get(middle + 1)) {
            return list.get(list.size() > middle + 1 ? middle + 1 :
list.size() - 1);
        }
    }
    return -1;
}
```

Interpolation Search (보간 탐색)

중간부터 찾지 말고, 실제 값이 있는 위치부터 찾기!

- 일반적 구현

```
public static int interpolationSearch(int[] arr, int target) {
    int left = 0;
    int right = arr.length - 1;
    int mid = 0;
    int count = 0;
    while(left <= right) {
        mid = (int)(((double)target - arr[left]) / (arr[right] -
arr[left]) * (right - left) + left);
        if(arr[mid] < target)
            left = mid + 1;
        else if (arr[mid] > target)
            right = mid - 1;
        else {
            System.out.println(count);
            return mid;
        }
        count++;
    }
    return Integer.MIN_VALUE;
}
```

- 재귀적 구현

```
public static int interpolationSearchRecursive(int[] arr, int target,
int left, int right) {
    if(arr[left] > target || arr[right] < target) // 값의 범위를 넘어서는 경
우 있음.
        return Integer.MIN_VALUE;
    int mid = (int)(((double)target - arr[left]) / (arr[right] -
arr[left]) * (right - left) + left);
    if(arr[mid] < target)
        return interpolationSearchRecursive(arr, target, left + 1,
right);
    else if (arr[mid] > target)
        return interpolationSearchRecursive(arr, target, left, right -
1);
    else
        return mid;
}
```

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