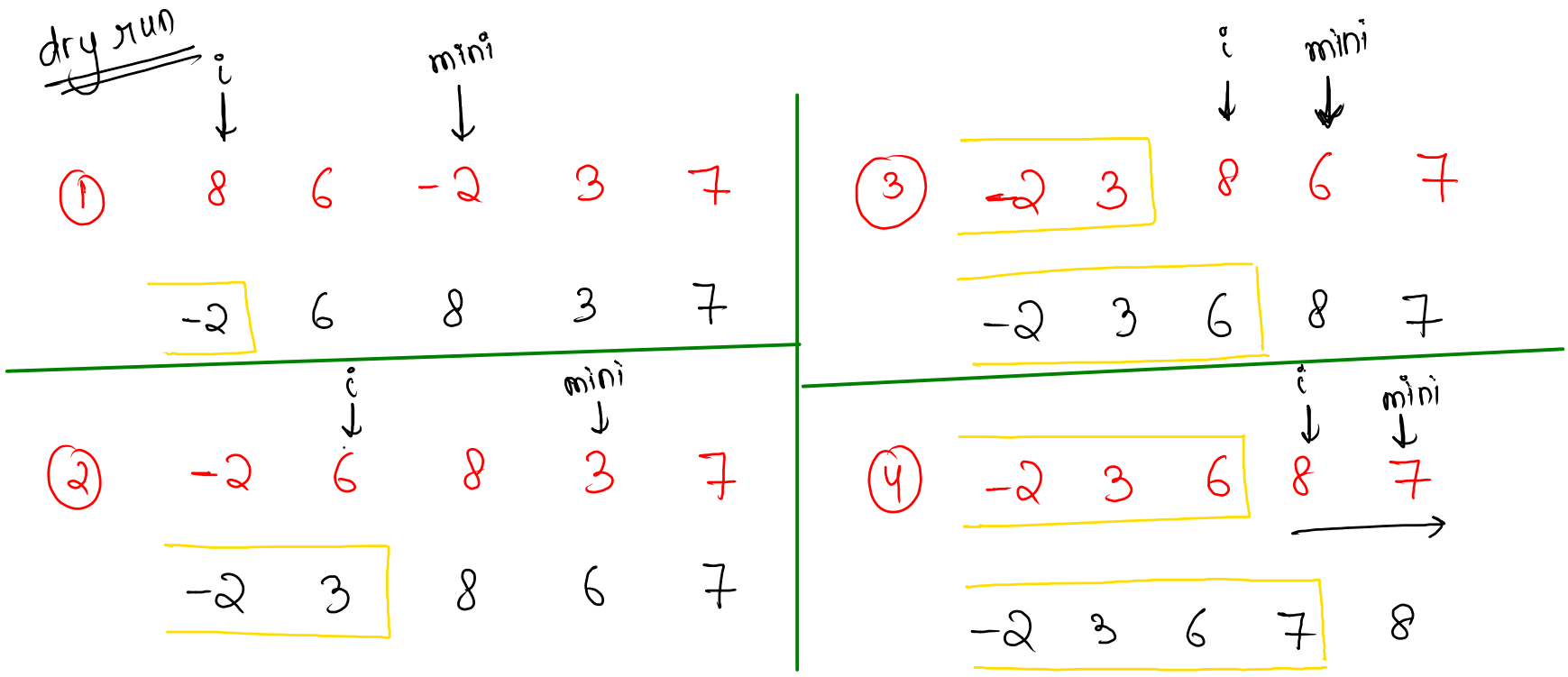
⇒ Selection Sort

↳ Pick smallest element from unsorted array, and place it in start of unsorted array

arr =

8	6	-2	3	7

dry run



psudo code

1) traverse 'i' from 0 to n-1

1.1) traverse 'mini' ('j') from i to n-1

1.1.1) find mini element

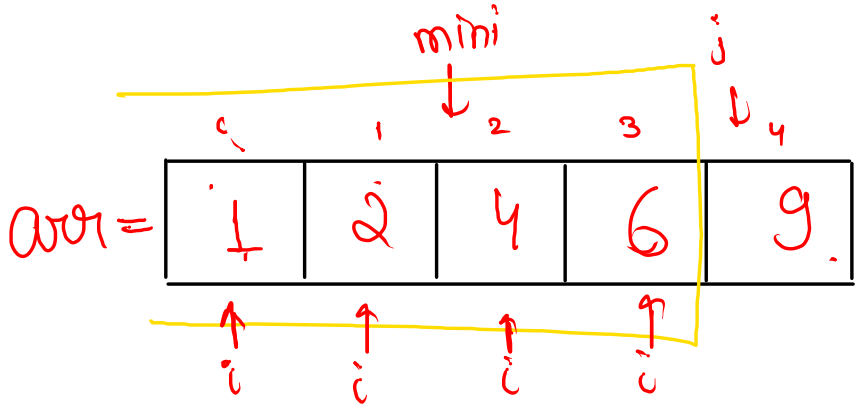
1.2) swap (mini , i)

Code

```java
public static void main(String[] args) {
    Scanner scn = new Scanner(System.in);
    int n = scn.nextInt();
    int[] arr = new int[n];
    for (int i = 0; i < n; i++) {
        arr[i] = scn.nextInt();
    }
    selectionSort(arr, n);
}

public static void selectionSort(int[] arr, int n) {
    for (int i = 0; i < n; i++) {
        int mini = i;   // index
        for (int j = i + 1; j < n; j++) {
            if ( arr[j] < arr[mini] ) {
                mini = j;
            }
        }
        swap(arr, i, mini);
    }

    // print
    for (int i = 0; i < n; i++) {
        System.out.print(arr[i] + " ");
    }
}

public static void swap(int[] arr, int x, int y) {
    int temp = arr[x];
    arr[x] = arr[y];
    arr[y] = temp;
}
```

$O(N^2)$

Constant



i < n-1

```
for (int i = 0; i < n; i++) {
    int mini = i;    // index
    for (int j = i + 1; j < n; j++) {
        if ( arr[j] < arr[mini] ) {
            mini = j;
        }
    }
    swap(arr, i, mini);
}
```

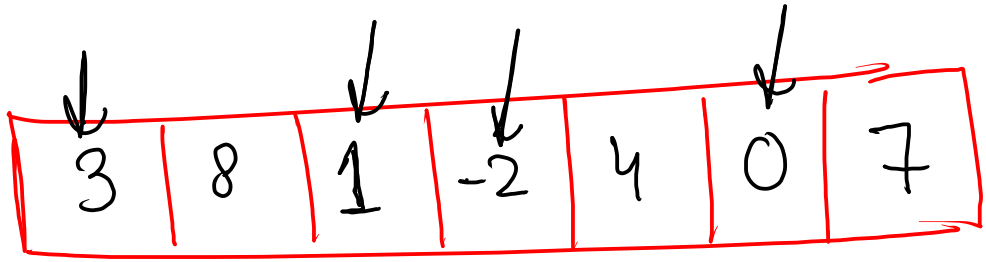
i=0
- j=1 (6<4) ✗
- j=2 (1<4) ✓
- j=3 (9<1) ✗
- j=4 (2<1) ✗

i=1
- j=2 (4<6) ✓
- j=3 (9<4) ✗
- j=4 (2<4) ✓

i=2
- j=3 (9<4) ✗
- j=4 (6<4) ✗

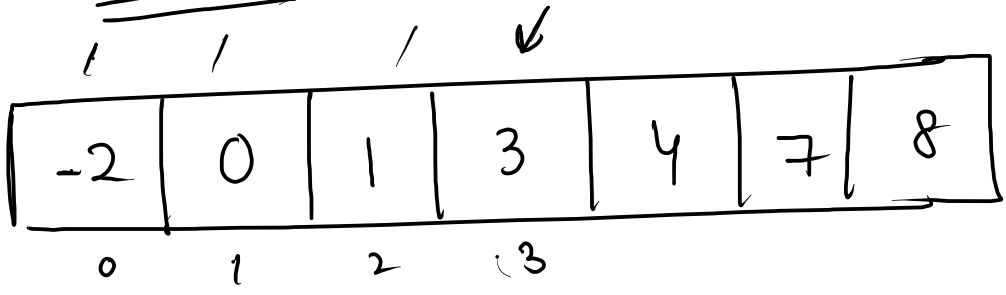
i=3
- j=4 (6<9) ✓

HW_Kth Smallest Element

arr = 

, k = 4

ans = 3

arr = 

,

print (arr [k-1])

code

```java
public static void main(String[] args) {
    Scanner scn = new Scanner(System.in);
    int n = scn.nextInt();
    int[] arr = new int[n];
    for (int i = 0; i < n; i++) {
        arr[i] = scn.nextInt();
    }
    int k = scn.nextInt();
    bubbleSort(arr, n);

    System.out.println(arr[k - 1]);
}

public static void bubbleSort(int[] arr, int n) {
    for (int i = 1; i <= n - 1; i++) {
        for (int j = 0; j < n - i; j++) {
            if ( arr[j] > arr[j + 1] ) {
                swap(arr, j, j + 1);
            }
        }
    }
}
public static void swap(int[] arr, int x, int y) {
    int temp = arr[x];
    arr[x] = arr[y];
    arr[y] = temp;
}
```

⇒ Inbuilt function

$O(N \log(N))$

↳ N is size of array

↳ Arrays.sort(arr);

↳ sort in ↑ing order

↳ Arrays.sort(arr, Collections.reverseOrder());

↳ sort in ↓ing order

→ Code for inbuilt function

ascending

```
public static void main(String[] args) {
    int[] arr = { 5, 6, 3, 1, -5, 8, 2 };
    int n = arr.length;

    Arrays.sort(arr);

    for (int i = 0; i < n; i++) {
        System.out.print(arr[i] + " ");
    }
}
```

descending

```
public static void main(String[] args) {
    int[] arr = { 5, 6, 3, 1, -5, 8, 2 };
    int n = arr.length;
    Integer[] arr1 = new Integer[n];
    for (int i = 0; i < n; i++) {
        arr1[i] = arr[i];
    }
    Arrays.sort(arr1, Collections.reverseOrder());

    for (int i = 0; i < n; i++) {
        System.out.print(arr1[i] + " ");
    }
}
```

wrapper classes

↓

int → Integer

boolean → Boolean

char → Character

double → Double

⋮

⇒ Comparator & Comparable (it will not effect T.C)

↳ used to modify the logic of inbuilt function

↳ Arrays.sort(arr)

Syntax :

code

```
public static void main(String[] args) {
    int[] arr = { 5, 6, 3, 1, -5, 8, 2 };
    int n = arr.length;
    Integer[] arr1 = new Integer[n];
    for (int i = 0; i < n; i++) {
        arr1[i] = arr[i];
    }
    // comparable & comparator
    Arrays.sort(arr1, new myComparator());

    for (int i = 0; i < n; i++) {
        System.out.print(arr1[i] + " ");
    }
}

public static class myComparator implements Comparator<Integer> {
    @Override
    public int compare(Integer a, Integer b) {
        return a - b;   // increasing order
        // return b - a; // decreasing order
    }
}
```