

Sorting - 2

arr \rightarrow [5, 4, 2, 1, 6]

\downarrow sort

arr \rightarrow [1, 2, 4, 5, 6]

Inbuilt sort

- 1) Handle duplicates
- 2) Empty array/array of size one
- 3) Negative elements
- 4) Custom sorting

arr = {1, 2, 3, 7, 5, 6} \rightarrow {0, 1, 2, 3, 5, 7}

Arrays.sort(arr); \Rightarrow Increasing order (by default)

\swarrow fn
 \searrow class

(defined by Java)

data type $\begin{cases} \rightarrow \text{Primitive} \rightarrow \text{int, float, boolean} \\ \rightarrow \text{Non-primitive} \rightarrow \text{String, ArrayList,} \\ \text{(user-defined)} \quad \text{user-defined,} \\ \quad \text{wrapper classes} \end{cases}$

\rightarrow No custom sorting

\rightarrow only sort in incr. order

1) Primitive arrays \Rightarrow int[], float[], boolean[]

Dual pivot quick sort \Rightarrow Time - $O(n \log n)$

Space - $O(1)$

2) Non-primitive arrays \Rightarrow Integer[], String[]

Tim sort $\begin{cases} \rightarrow \text{Insertion sort } (n \leq 16) \\ \rightarrow \text{merge sort } (n > 16) \end{cases}$

Heap

\downarrow

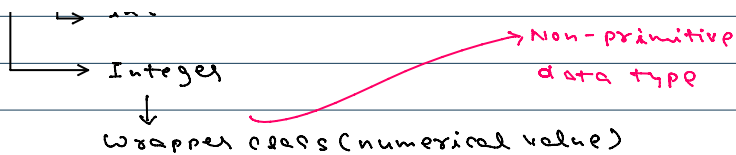
Time - $O(n \log n)$

Space - $O(n)$

Data type to store my salary

\swarrow int
 \searrow Integer

\rightarrow Non-primitive data type

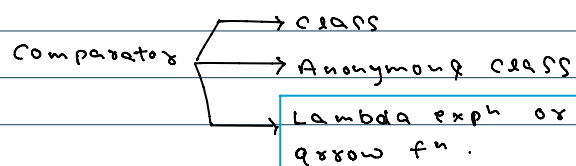


Comparator \rightarrow logic to compare two values

Comparator will only work for non-primitive values.

default $\Rightarrow 10, 15 \checkmark$

$15, 10 \Rightarrow 10, 15 \Rightarrow$ swap



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Arrays.sort(arr, (a, b)  $\rightarrow$  integer);
```

(a, b)

a before $b \Rightarrow \ominus$ ve value {no swap}

b before $a \Rightarrow \oplus$ ve value {swap}

$a == b$ (same priority) $\Rightarrow 0$ value

Increasing order

$arr \rightarrow [10, 15]$

$a = 10, b = 15$

\ominus ve value $\Rightarrow a - b$

$arr \rightarrow [8, 5]$

$a = 8, b = 5$

\oplus ve value $\Rightarrow a - b$

$a - b$

\Downarrow
`Arrays.sort(arr, (a, b) \rightarrow a - b);`

Decreasing order

$arr \rightarrow [9, 7]$

$arr \rightarrow [6, 10]$

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$arr \rightarrow [9, 7]$

$a: 9, b: 7$

$\ominus$ ve value  $\Rightarrow b - a$

$arr \rightarrow [6, 10]$

$a: 6, b: 10$

$\oplus$ ve value  $\Rightarrow b - a$

$b - a$

$\Downarrow$

`Arrays.sort(arr, (a, b) -> b - a);`

|         |         |
|---------|---------|
| int     | Integer |
| float   | Float   |
| boolean | Boolean |
| double  | Double  |

data  
type

wrapper  
class

Sort the array according to  
their Square of each element

Sample Input 0

5  
4 -1 0 -5 6

Sample Output 0

0 -1 4 -5 6

$-5 \quad -1 \quad 0 \quad 4 \quad 6$

$4 \quad 1 \quad 0 \quad 5 \quad 6$

$0 \quad 1 \quad 4 \quad 5 \quad 6$

$0 \quad -1 \quad 4 \quad -5 \quad 6$

$$(-1)^2 = 1$$

$$(-5)^2 = 25$$

$arr[i] > arr[j] \quad \times$

$arr[i] * arr[i] > arr[j] * arr[j] \quad \checkmark$

`Arrays.sort`

$arr \rightarrow [-5, 6] \rightarrow [-5, 6]$

$a: -5, b: 6$

$\ominus$ ve value  $\Rightarrow a * a - b * b$

$arr \rightarrow [6, -5] \rightarrow [-5, 6]$

$a: 6, b: -5$

$\oplus$ ve value  $\Rightarrow a * a - b * b$

$arr \rightarrow [7, 9]$   $\rightarrow [7, 9]$

$a = 7, b = 9$

$\ominus$  ve value  $\Rightarrow a * a - b * b$

$arr \rightarrow [-9, -7]$   $\rightarrow [-7, -9]$

$a = -9, b = -7$

$\oplus$  ve value  $\Rightarrow a * a - b * b$

$arr \rightarrow [-9, 7]$   $\rightarrow [7, -9]$

$a = -9, b = 7$

$\oplus$  ve value  $\Rightarrow a * a - b * b$