

Counting Sort

[1, 1000]

[1, 26]

$$N = 10^7 \xrightarrow{\text{Intro Sort}} O(N \log N) \rightarrow 10^7 \times 24 = 2.4 \times 10^8 \approx 2.4s$$

$$\xrightarrow{\text{Counting Sort}} O(N) \rightarrow 10^7 \approx 0.1s$$

— o —

arr → 5 1 2 7 10 0 1 2 3

↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑

0 → 1

1 → 11

2 → 11

3 → 1

4 → x

5 → 1

6 → x

7 → 1

8 → x

9 → x

10 → 1

0 1 1 2 2 3 5 7 10

dev skill

a b e d e z

↓ ↓ ↓ ↓ ↓ ↓

0 0 0 0 0 0

countingSort(arr)

```
{ n = |arr|;
  vector<int> freq(1001, 0);
```

```
  for(int v : arr)
    freq[v]++
```

index = 0

```
  for(int value = 0; value < 1000; value++)
  {
```

```
    int cnt = freq[value];
    while(cnt--)
```

size value

[0, 1000]

freq[15] = 1 [3] = 1

 [1] = 1 [101] = 1

 [09] = 1

15, 1, 99, 3, 101

cnt = freq[1] = 1

2n

Σ f = N

$$\sum f = N$$

$$N + 10^6$$

$$\downarrow$$

$$10^3 + 10^6$$

```

int cnt = freq[value];
while (cnt-- > 0)
{
    arr[index++] = value;
}
    
```

1	3	15	29	101
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— 0 —

$$y = x^2 - 5x + 6$$

$$y = 0$$

$$[0, 2.5]$$

$$x = 0$$



$$x = 2.5$$

2, 7, 3, 4, 9

2	9	12	16	25
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