

Sortowanie pozycyjne i przez zliczanie – przykład

Tablicę napisów A sortujemy sortowaniem pozycyjnym, gdzie każdą pozycję sortujemy przez zliczanie. Pokazać jak będzie się zmieniała tablica liczników C i jak będzie przebiegało sortowanie.

Zerowanie tablicy liczników

```
for i=1 to k
  C[i]=0
```

| | | | |
|--------|------|--|---|
| A: cee | C: a | | 0 |
| abc | b | | 0 |
| abb | c | | 0 |
| edc | d | | 0 |
| adb | e | | 0 |
| aea | | | |

Zliczanie ilości wystąpień znaków

```
for j=1 to A.length
  C[A[j]] = C[A[j]]+1
```

| | | | | |
|--------|-----|------|--|----------------|
| A: cee | ← j | C: a | | 0 |
| abc | | b | | 0 |
| abb | | c | | 0 |
| edc | | d | | 0 |
| adb | | e | | 0 1 |
| aea | | | | |

| | | | | |
|--------|-----|------|--|----------------|
| A: cee | | C: a | | 0 |
| abc | ← j | b | | 0 |
| abb | | c | | 0 1 |
| edc | | d | | 0 |
| adb | | e | | 0 1 |
| aea | | | | |

| | | | | | |
|----|---------|----|---|--|----------------|
| A: | cee | C: | a | | 0 |
| | abc | | b | | 0 1 |
| | abb ← j | | c | | 0 1 |
| | edc | | d | | 0 |
| | adb | | e | | 0 1 |
| | aea | | | | |

| | | | | | |
|----|---------|----|---|--|-----------------------------|
| A: | cee | C: | a | | 0 |
| | abc | | b | | 1 0 |
| | abb | | c | | 0 1 2 |
| | edc ← j | | d | | 0 |
| | adb | | e | | 0 1 |
| | aea | | | | |

| | | | | | |
|----|---------|----|---|--|-----------------------------|
| A: | cee | C: | a | | 0 |
| | abc | | b | | 0 1 2 |
| | abb | | c | | 0 1 2 |
| | edc | | d | | 0 |
| | adb ← j | | e | | 0 1 |
| | aea | | | | |

| | | | | | |
|----|-------|----|---|--|-----------------------------|
| A: | cee | C: | a | | 0 1 |
| | abc | | b | | 0 1 2 |
| | abb | | c | | 0 1 2 |
| | edc | | d | | 0 |
| | adb | | e | | 0 1 |
| | aea ← | | | | |

Zliczanie, ile jest znaków mniejszych lub równych każdemu znakowi

```
for i=2 to k
  C[i] = C[i-1]+C[i]
```

| | | |
|--------|------|---------|
| A: cee | C: a | 0 1 |
| abc | b | 0 1 2 3 |
| abb | c | 0 1 2 5 |
| edc | d | 0 5 |
| adb | e | 0 1 6 |
| aea | | |

Wypełnianie tablicy B zawierającej posortowane napisy z tablicy A.

```
for j=A.length to 1
  B[C[A[j]]] = A[j]
  C[A[j]] = C[A[j]]-1
```

| | | | | |
|--------|------|-------|------|---------|
| cee | B: 1 | aea ← | C: a | 0 1 0 ← |
| A: abc | 2 | | b | 0 1 2 3 |
| abb | 3 | | c | 0 1 2 5 |
| edc | 4 | | d | 0 5 |
| adb | 5 | | e | 0 1 6 |
| aea ← | 6 | | | |

| | | | | |
|--------|------|-------|------|-------------|
| A: cee | B: 1 | aea | C: a | 0 1 0 |
| abc | 2 | | b | 0 1 2 3 2 ← |
| abb | 3 | adb ← | c | 0 1 2 5 |
| edc | 4 | | d | 0 5 |
| adb ← | 5 | | e | 0 1 6 |
| aea | 6 | | | |

A: cee
 abc
 abb
 edc ←
 adb
 aea

B: 1 | aea
 2 |
 3 | adb
 4 |
 5 | edc ←
 6 |

C: a | ~~0~~ 1 0
 b | ~~0~~ ~~1~~ ~~2~~ ~~3~~ 2
 c | ~~0~~ ~~1~~ ~~2~~ ~~5~~ 4 ←
 d | 0 5
 e | ~~0~~ ~~1~~ 6

A: cee
 abc
 abb ←
 edc
 adb
 aea

B: 1 | aea
 2 | abb ←
 3 | adb
 4 |
 5 | edc
 6 |

C: a | ~~0~~ 1 0
 b | ~~0~~ ~~1~~ ~~2~~ ~~3~~ ~~2~~ 1 ←
 c | ~~0~~ ~~1~~ ~~2~~ ~~5~~ 4
 d | 0 5
 e | ~~0~~ ~~1~~ 6

A: cee
 abc ←
 abb
 edc
 adb
 aea

B: 1 | aea
 2 | abb
 3 | adb
 4 | abc ←
 5 | edc
 6 |

C: a | ~~0~~ 1 0
 b | ~~0~~ ~~1~~ ~~2~~ ~~3~~ ~~2~~ 1
 c | ~~0~~ ~~1~~ ~~2~~ ~~5~~ ~~4~~ 3 ←
 d | 0 5
 e | ~~0~~ ~~1~~ 6

A: cee ←
 abc
 abb
 edc
 adb
 aea

B: 1 | aea
 2 | abb
 3 | adb
 4 | abc
 5 | edc
 6 | cee ←

C: a | ~~0~~ 1 0
 b | ~~0~~ ~~1~~ ~~2~~ ~~3~~ ~~2~~ 1
 c | ~~0~~ ~~1~~ ~~2~~ ~~5~~ ~~4~~ 3
 d | 0 5
 e | ~~0~~ ~~1~~ ~~6~~ 5 ←

Sortowanie przez zliczanie według drugiej pozycji.

Zerowanie tablicy liczników

| | | |
|--------|------|---|
| A: aea | C: a | 0 |
| abb | b | 0 |
| adb | c | 0 |
| abc | d | 0 |
| edc | e | 0 |
| cee | | |

Zliczanie ilości wystąpień znaków

| | | | |
|--------|-----|------|----------------|
| A: aea | ← j | C: a | 0 |
| abb | | b | 0 |
| adb | | c | 0 |
| abc | | d | 0 |
| edc | | e | 0 1 |
| cee | | | |

| | | | |
|--------|-----|------|----------------|
| A: aea | | C: a | 0 |
| abb | ← j | b | 0 1 |
| abd | | c | 9 |
| abc | | d | 0 |
| edc | | e | 0 1 |
| cee | | | |

| | | | |
|--------|-----|------|----------------|
| A: aea | | C: a | 0 |
| abb | | b | 0 1 |
| adb | ← j | c | 0 |
| abc | | d | 0 1 |
| edc | | e | 0 1 |
| cee | | | |

| | | |
|---------|------|-----------------------------|
| A: aea | C: a | 0 |
| abb | b | 0 1 2 |
| adb | c | 0 |
| abc ← j | d | 0 1 |
| edc | e | 0 1 |
| cee | | |

| | | |
|---------|------|-----------------------------|
| A: aea | C: a | 0 |
| abb | b | 0 1 2 |
| adb | c | 0 |
| abc | d | 0 1 2 |
| edc ← j | e | 0 1 |
| cee | | |

| | | |
|---------|------|-----------------------------|
| A: aea | C: a | 0 |
| abb | b | 0 1 2 |
| adb | c | 0 |
| abc | d | 0 1 2 |
| edc | e | 0 1 2 |
| cee ← j | | |

Zliczanie, ile jest znaków mniejszych lub równych każdemu znakowi

```
for i=2 to k
  C[i] = C[i-1]+C[i]
```

| | | |
|--------|------|-------------------------------|
| A: aea | C: a | 0 |
| abb | b | 0 1 2 |
| adb | c | 0 2 |
| abc | d | 0 1 2 4 |
| edc | e | 0 1 2 6 |
| cee | | |

Wypełnianie tablicy B zawierającej posortowane napisy z tablicy A.

```
for j=A.length to 1
  B[C[A[j]]] = A[j]
  C[A[j]] = C[A[j]]-1
```

| | | | |
|---------|------|------|-----------------------------------|
| A: aea | B: 1 | C: a | 0 |
| abb | 2 | b | 0 1 2 |
| adb | 3 | c | 0 2 |
| abc | 4 | d | 0 1 2 4 |
| edc | 5 | e | 0 1 2 6 5 ← |
| cee ← j | 6 | | cee ← |

| | | | |
|---------|------|------|-----------------------------------|
| A: aea | B: 1 | C: a | 0 |
| abb | 2 | b | 0 1 2 |
| adb | 3 | c | 0 2 |
| abc | 4 | d | 0 1 2 4 3 ← |
| edc ← j | 5 | e | 0 1 2 6 5 |
| cee | 6 | | cee |

| | | | |
|---------|------|------|---------------------------------|
| A: aea | B: 1 | C: a | 0 |
| abb | 2 | b | 0 1 2 1 ← |
| adb | 3 | c | 0 2 |
| abc ← j | 4 | d | 0 1 2 4 3 |
| edc | 5 | e | 0 1 2 6 5 |
| cee | 6 | | cee |

| | | | |
|---------|------|------|--|
| A: aea | B: 1 | C: a | 0 |
| abb | 2 | b | 0 1 2 1 |
| adb ← j | 3 | c | 0 2 |
| abc | 4 | d | 0 1 2 4 3 2 ← |
| edc | 5 | e | 0 1 2 6 5 |
| cee | 6 | | cee |

A: aea
 abb ← j
 adb
 abc
 edc
 cee

B: 1 | abb ←
 2 | abc
 3 | adb
 4 | edc
 5 |
 6 | cee

C: a | 0
 b | ~~0~~ ~~1~~ ~~2~~ ~~1~~ 0 ←
 c | 0 2
 d | ~~0~~ ~~1~~ ~~2~~ ~~4~~ ~~3~~ 2
 e | ~~0~~ ~~1~~ ~~2~~ ~~6~~ 5

A: aea ← j
 abb
 adb
 abc
 edc
 cee

B: 1 | abb
 2 | abc
 3 | adb
 4 | edc
 5 | aea ←
 6 | cee

C: a | 0
 b | ~~0~~ ~~1~~ ~~2~~ ~~1~~ 0
 c | 0 2
 d | ~~0~~ ~~1~~ ~~2~~ ~~4~~ ~~3~~ 2
 e | ~~0~~ ~~1~~ ~~2~~ ~~6~~ ~~5~~ 4 ←

Sortowanie przez zliczanie według trzeciej pozycji – analogicznie.