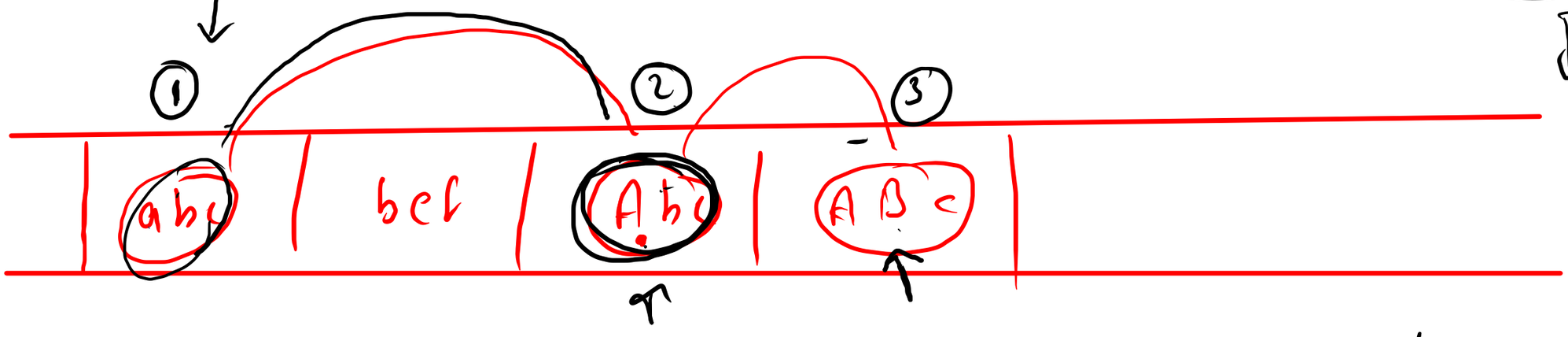
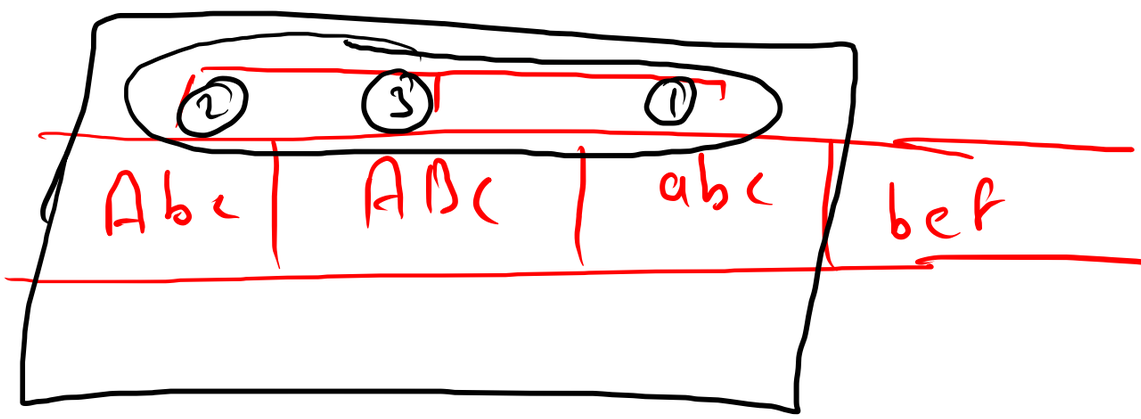
a s
m a

$n \log(n)$

$O(n + lc)$





- ☆ stable
- ☆ non-stable

non-stable

Count sort

3 | 7 | 5 | 8 | 3' | 5' | 6 | 7' | 9 | 7''

max = 5
min = 3

Index maping
val - min

max - min + 1
5 - 3 + 1 = 7

0	1	2	3	4	5	6
2	0	2	1	3	1	1

(1)

3	4	5	6	7	8	9

Prefix sum

0	1	2	3	4	5	6
0	2	2	4	5	8	9

(2)

3	4	5	6	7	8	9

val ←
ps ←
ind = ps - 1
ps - -

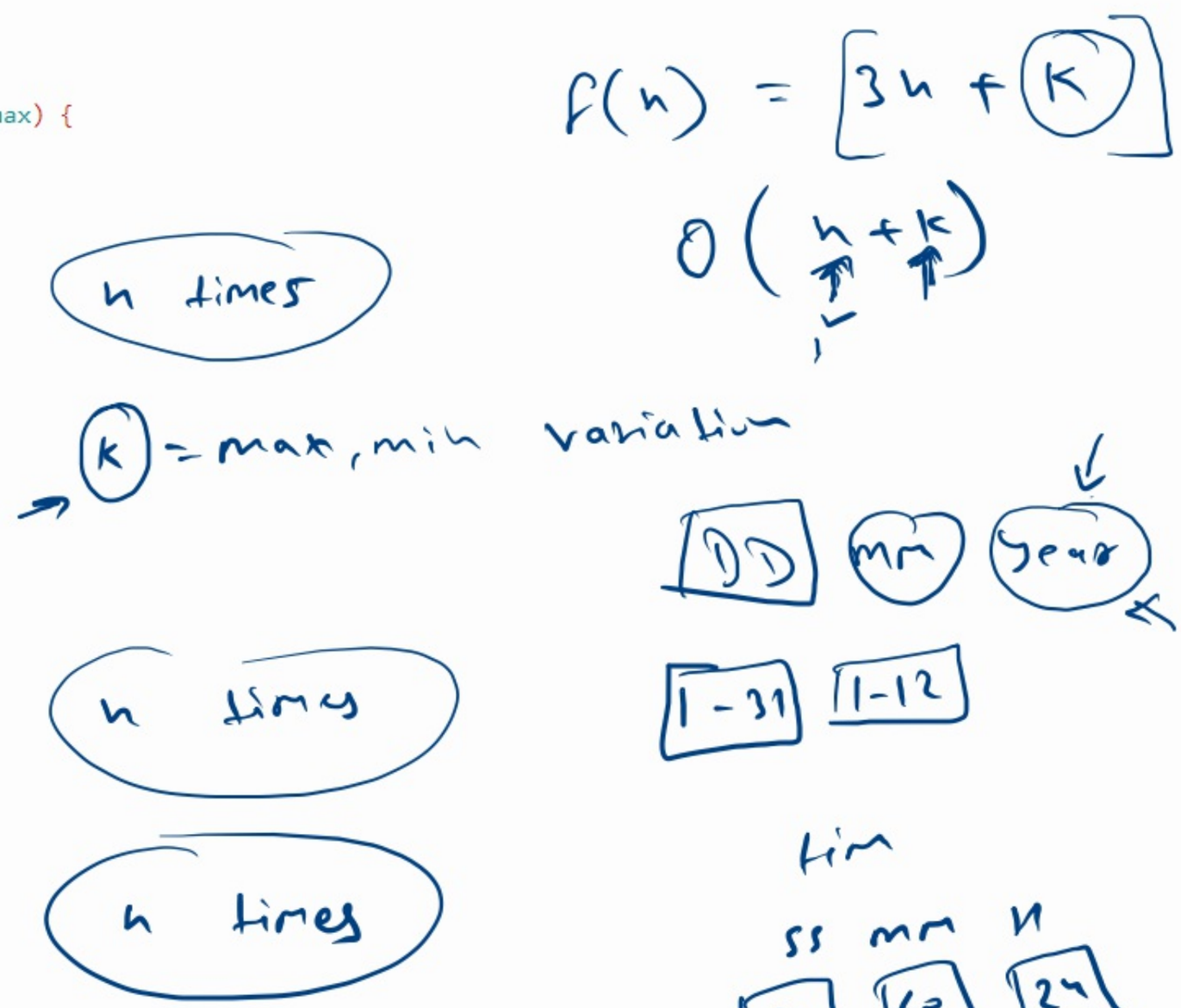
Stable sorting

3	3'	5	5'	6	7	7'	7''	8	9

0	1	2	3	4	5	6	7	8	9

(3)

```java
import java.io.*;
import java.util.*;

public class Main {

  public static void countSort(int[] arr, int min, int max) {

        int size = max-min+1;
        int count[] = new int[size];

        for(int val: arr){
            int ind = val-min;
            count[ind]++;
        }

        for(int i=1; i<size;i++){
            count[i] = count[i] + count[i-1];
        }

        int ans[] = new int[arr.length];

        for(int i=arr.length-1;i>=0;i--){
            int val = arr[i];

            int ind = val-min;
            int ps = count[ind];

            ans[ps-1] = val;
            count[ind]--;
        }

        for(int i=0;i<arr.length;i++){
            arr[i] = ans[i];
        }
  }

  public static void print(int[] arr) {
    for (int i = 0; i < arr.length; i++) {
      System.out.println(arr[i]);
    }
```



count sort

digit = (val / exp) % 10

2 1 3
0 9 7
7 1 8
1 2 3
3 7
4 4 3
9 8 2

ones

2 6 7
3 6 5
2 9 4

2 9 4
3 6 5
2 6 7

3 6 5
2 6 7
2 9 4

2 6 7
2 9 4
3 6 5

•		
1	2	3
2	5	7
1	1	1
2	4	2

	1	2	3
small	1	1	1
	2	5	7
	2	4	2

1 2 3
2 5 7
1 1 1
2 4 2

•		
1	1	1
2	4	2
1	2	3
2	5	7

	1	1	1
1	2	3	
2	4	2	
2	5	7	

	1	1	1
1	2	3	
2	4	2	
2	5	7	

1 1 1
1 2 3
2 4 2
2 5 7

```
1 2 3

  2 5 7
1 1 1
2 4 2
```

exp

1

10

100

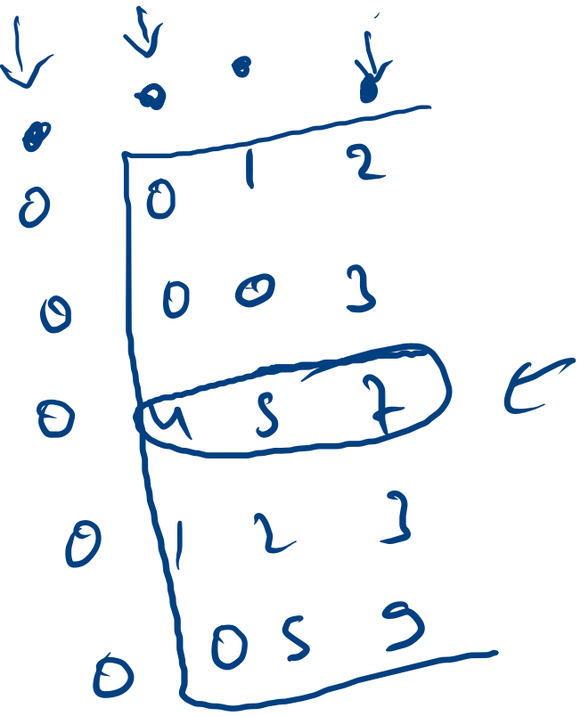
257

1 — 257/1 = 257₀/₀10 = 7

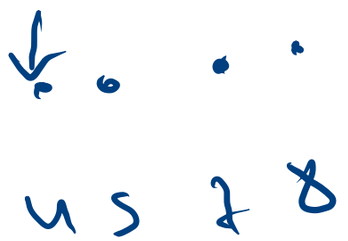
10 — 257/10 = 25₀/₀10 = 5

100 — 257/100 = 2₀/₀10 = 2

★ digit = (val / exp) %10



max



457 / 1 = 457

457 / 10 = 45

457 / 100 = 4

457 / 1000 = 0

1 ext

10 ext

100 ext

1000 ext

M.W. Sort Dates

DD:MM:YYYY

12041996
20101996
05061997
12041989

D m year

12 04 1996

20 10 1996

05 06 1997

12 04 1985

1...31

1...12

0.... 2500

12041996

0 1 2

O(n)

2*n

1xh

0 1 2 1 0 2 1 1 1 2 2 0 0 1 0 1 2 0 1

0 0 0 0 0 0 0

0

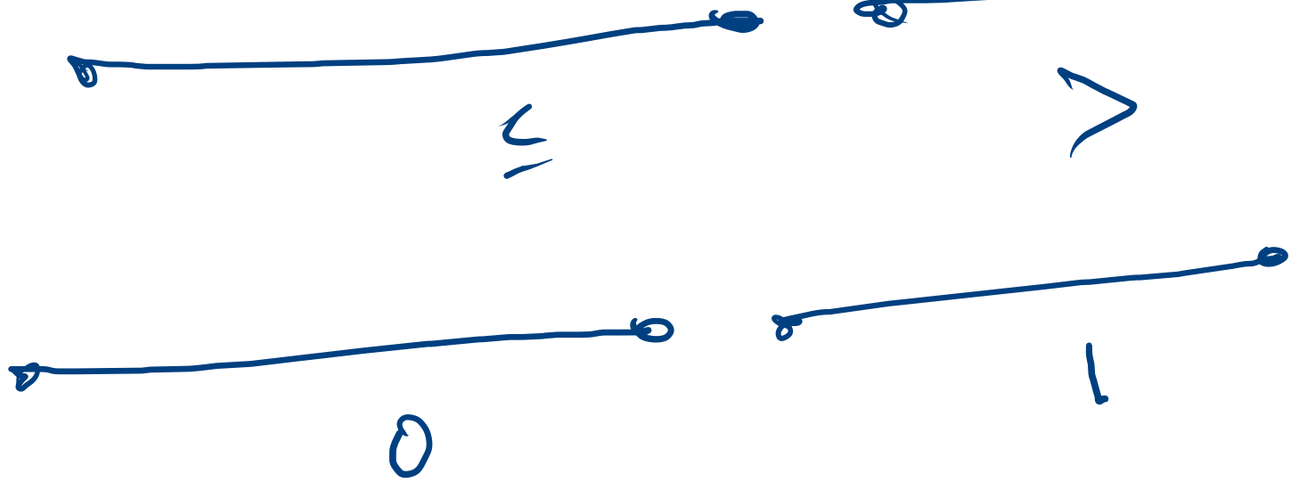
1 1 1 1 1 1 1 1

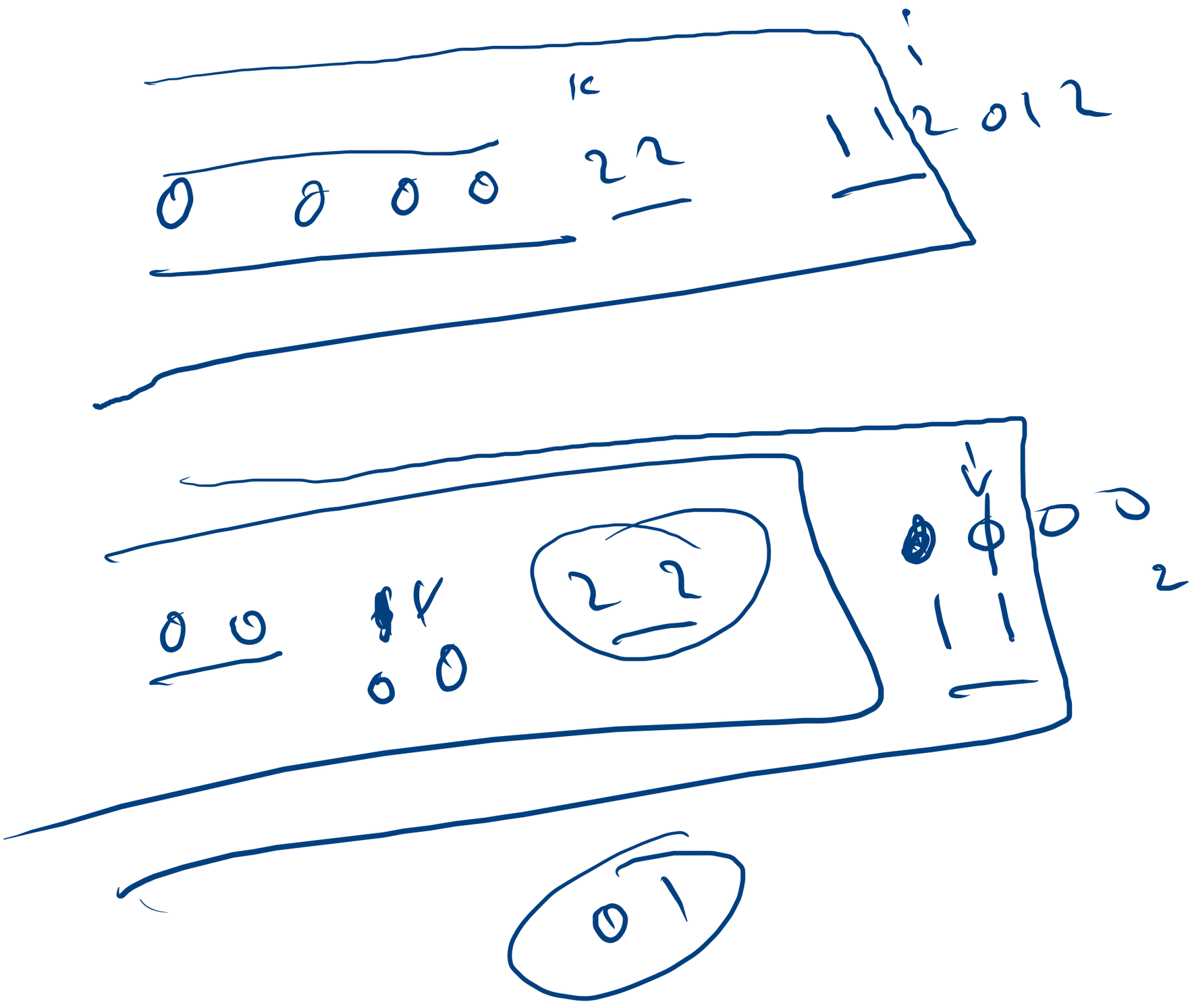
1

2 2 2 2 2

2

0 1





0 1 2 1 0 2 1 1 1 2 2 0 0 1 0 1 2 0 1

0... j-1 → 0

j... i-1 → 1

k+1 ... n-1 → 2

i = 0

j = 0

k = ??

val = 0

swap(i, j)

i++

j++

val = 1

i++

val = 2

swap(i, k)

k--

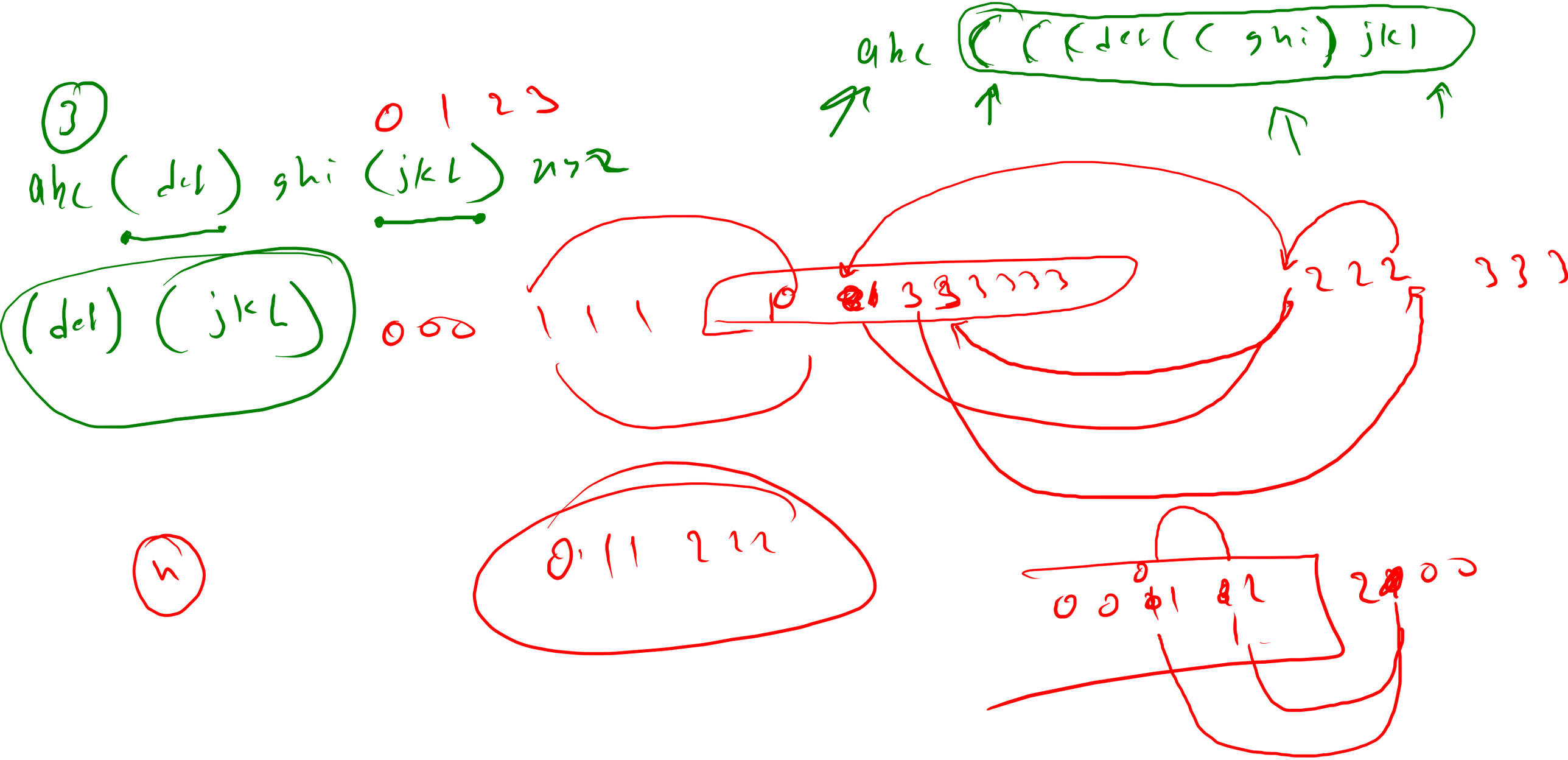
i > k

2 1 0

0 0 1 1 2 0 1

i < k

i ≤ k


abc (((def ((ghi) jkl
3
abc (def) ghi (jkl) xyz
0 1 2 3
(def) (jkl)
000
111
0 1 3 3 3 3
2 2 2
3 3 3
4
0 11 2 22
0 0 1 2
2 0 0

N KNIGHTS [easier]

3 kni