

String Algorithms - I





How Strings are created in Java?

```
// Most common, short way
String str1 = "Hello World";

// Using the `new` keyword and passing text to the constructor
String str2 = new String("Hello World");

// Initializing an array of characters and assigning them to a String
char[] charArray = {'H', 'e', 'l', 'l', 'o', ' ', 'W', 'o', 'r', 'l', 'd'};
String str3 = new String(charArray);
```

Strings are Immutable in Java

How Strings are stored in Java?



String Methods

indexOf()

contains()

substring()

trim()

isEmpty()

And so on...

More can be found here: <https://www.programiz.com/java-programming/library/string>

StringBuilder & StringBuffer

Methods:

- `append()`
- `insert()`
- `replace()`
- `delete()`
- `reverse()`



	String	StringBuffer	StringBuilder
Mutable	No	Yes	Yes
Thread-Safe	Yes	Yes	No
Time Efficient	No	No	Yes
Memory Efficient	No	Yes	Yes



Check if Two Strings are Anagram of each other.



Reverse the words in a given String

Practice Problems

1. Check if a String is a subsequence of another string.
 - a. abbc is subsequence of paabcbbcd
 - b. abc is not subsequence of baacd
2. Find the Leftmost character that repeats in a String.
 - a. p is the leftmost character that repeats in applejuice
3. Find the length of the last word in a given String
 - a. The length of the last word in "I am the boss" is 4 (boss)

a a b c
x x y z

a → x
b → y
c → z

102 | -
97

String Algorithms - II

Pattern Matching Algorithm - Naive

text: 
 pattern: → $O(n \times m)$

Rabin Karp Algorithm

① IPS

pattern:



KMP Algorithm $\rightarrow O(n)$.

longest prefix suffix
proper

0 1 2 3 4 5 6
 $(a \ b \ a \ b)c \ a \ b$

Ibs :

0	0	1	2	0	1	2
---	---	---	---	---	---	---

 ↗
 ↗

0: $P \rightarrow "", S \rightarrow a$

1: $P \rightarrow "", S \rightarrow b, ab$

2: $P \rightarrow "", S \rightarrow a, \underline{ba}, aba$

Prefix: 'abc'
 ↓
 Suffix: ., a, ab
 c, bc, abc

3: $P \rightarrow "", S \rightarrow b, \underline{ab}, bab, abab$

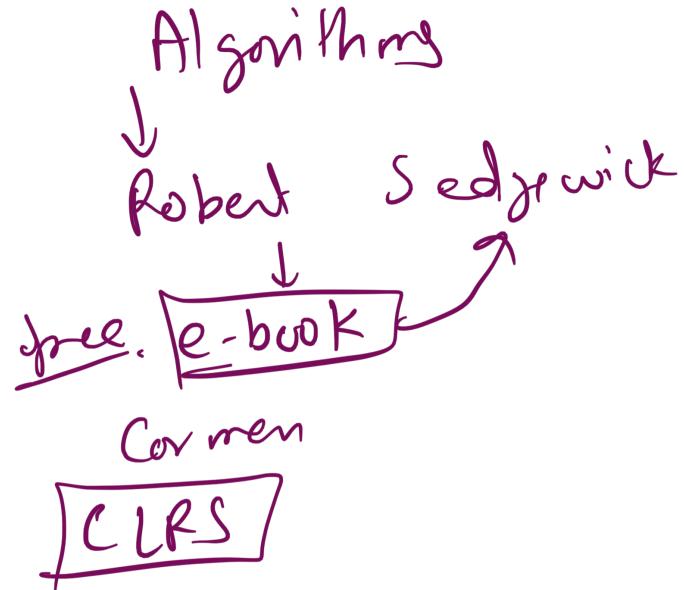
4: ababc

5: qbabca

6: ababcab

S.contains() $\rightarrow (n+m)$

Check if Strings are rotations.



Practice Problems

1. Learn about KMP Algorithm
2. Find the longest substring with distinct characters. ✓
3. <https://www.interviewbit.com/courses/programming/strings>

Sorting Algorithm - I



Bubble Sort



Insertion Sort

Selection Sort

Insertion of Two Sorted Arrays



Sort an array with three types of elements.

Practice Problems

1. ✓ Union of Two Sorted Arrays

- a. Union of [1, 2, 2, 3, 5] and [2, 3, 3, 4] is [1, 2, 3, 4, 5]

- 2. Find the minimum difference between two elements in an array.
 - a. Minimum difference in this array: [6, 18, 1, 9, 14] is 3 (because 9-6 = 3)
- 3. Sort an array of two types of elements.

KMP,

Samsung Github link

Q longest substring with distinct characters.

a b c d c a p b b b c $\Rightarrow \underline{\Sigma}$

Brute force

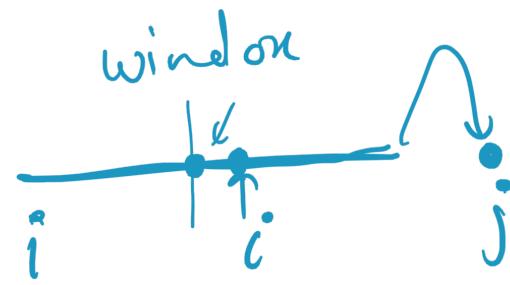
$O(n^3)$

$O(N)$
if Distinct()

$ans = 0$

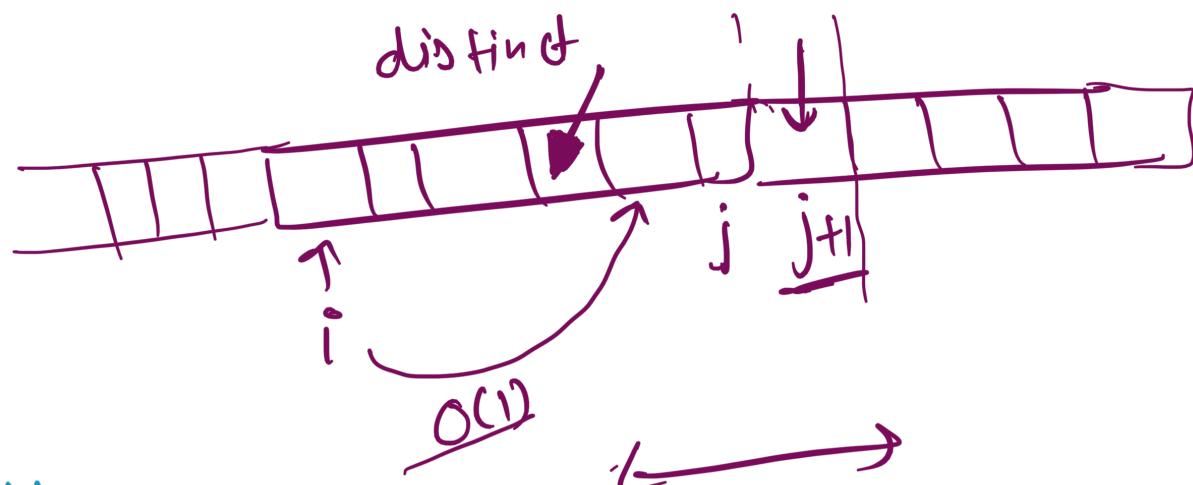
[
for (int i=0; i<n; i++)
 for (j=i+1; j<n; j++)
 if (Distinct(s[i:j]))
 ans = Math.max(ans, j-i+1);

ans2 Math.max(ans,
 $j-i+1$)



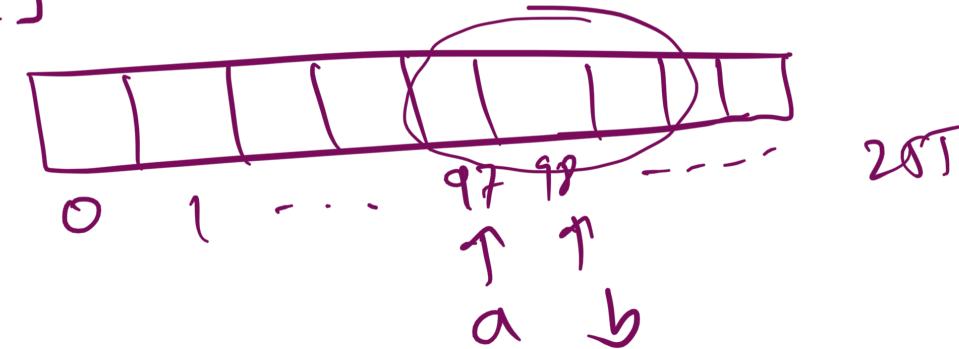
all distinct

$$j = j+1$$



\rightarrow size +1

$AS^{[I \leftarrow I-1]}_{[2 \leftarrow 6]}$. \rightarrow indent]



index
↓

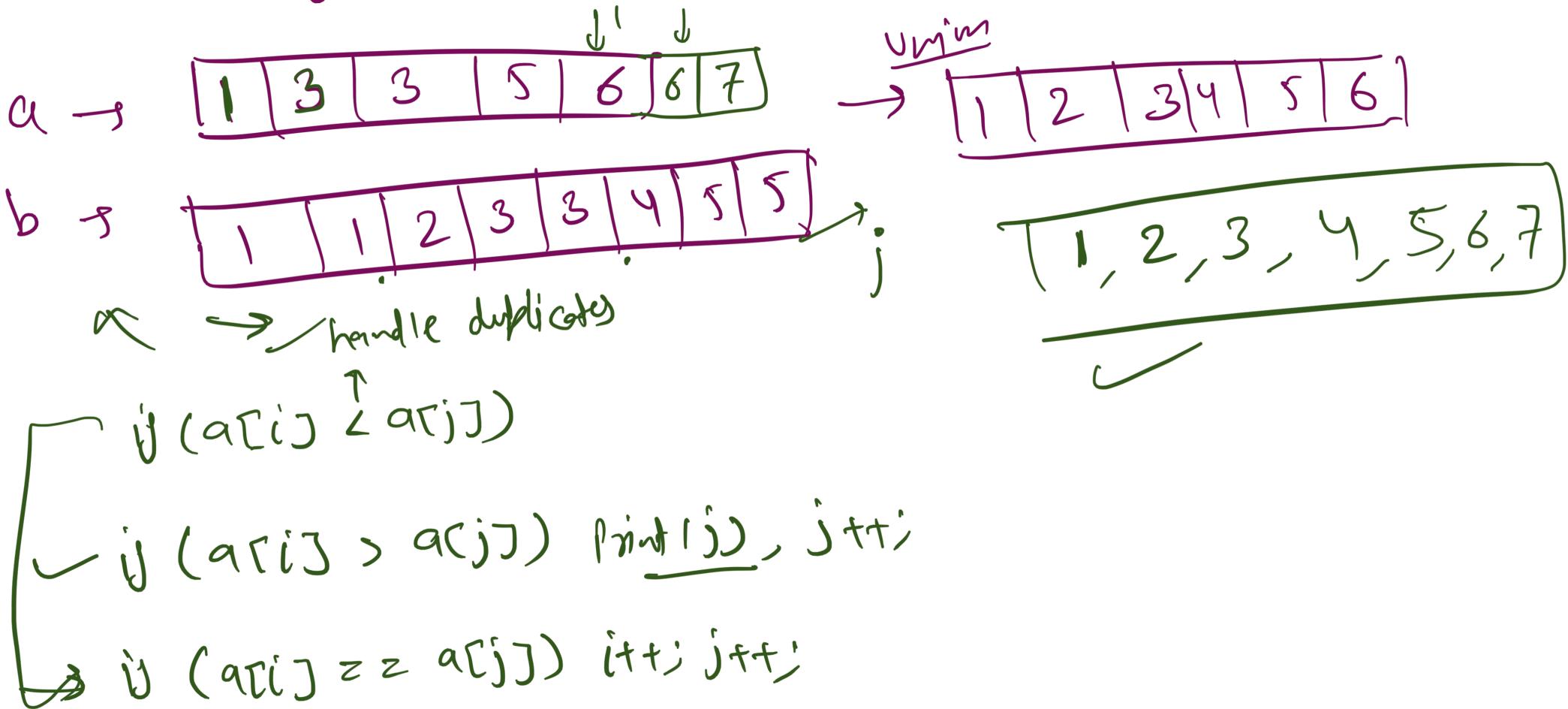
i
↓
a b c d c a p b b b c
0 1 2 3 4 5 6 7 8 9 10

a	5
b	9
c	10
d	3
:	
p	6
q	
i	

$$\text{ans} = \frac{j-i+1}{15}$$

logic of

Union of two sorted arrays



```
ArrayList<Integer> arr = new ArrayList<>();
```

```
arr.add(a[i]);
```

```
'
```

```
:
```

```
arr.toArray();
```

contiguous
of

a b c a

Substrings → a, ab, abc, bca, abca

Subsequences → a, ab, ac, ba

dbfa