

We were given a set of strings and we get some queries, where for each query we need to tell whether the element is present or not in the set.

HashMap \rightarrow TC for each query

\downarrow
 $\langle \text{key}, \text{value} \rangle$
 \downarrow

HashSet \rightarrow key

searches uses the key to create hash value.

TC \rightarrow hash func
 \hookrightarrow $O(l)$

$l \rightarrow$ len of target string

SC \rightarrow

$SC \rightarrow \underbrace{O(n \times d)}_{\text{looser bound}}$

String

1 char \rightarrow 1 Byte

We have a big dict of words (ASCII char)

length $\rightarrow 1 \rightarrow _ \rightarrow 256 \times 1$

length $\rightarrow 2 \rightarrow \underline{\quad} \underline{\quad} \rightarrow 256 \times 256 \times 2$

length $\rightarrow 3 \rightarrow _ _ _ \rightarrow 256^3 \times 3$

length $\rightarrow l$
 \downarrow
 max len

$\rightarrow \text{---} \rightarrow 256^l \times l$
 Se $\rightarrow O(2^l)$

↓
256

Sum then
up

$$Sc \rightarrow O(256^4 \times 2)$$

Sam
Sameer
Samir

7

at each level 1. tries to store common prefixes

Prefix Tree (Trie)

n-ary tree

null is a common prefix

for everything
apple
api

$O(d)$

che

api pie

banana

cherry

cherry

cherry

ban

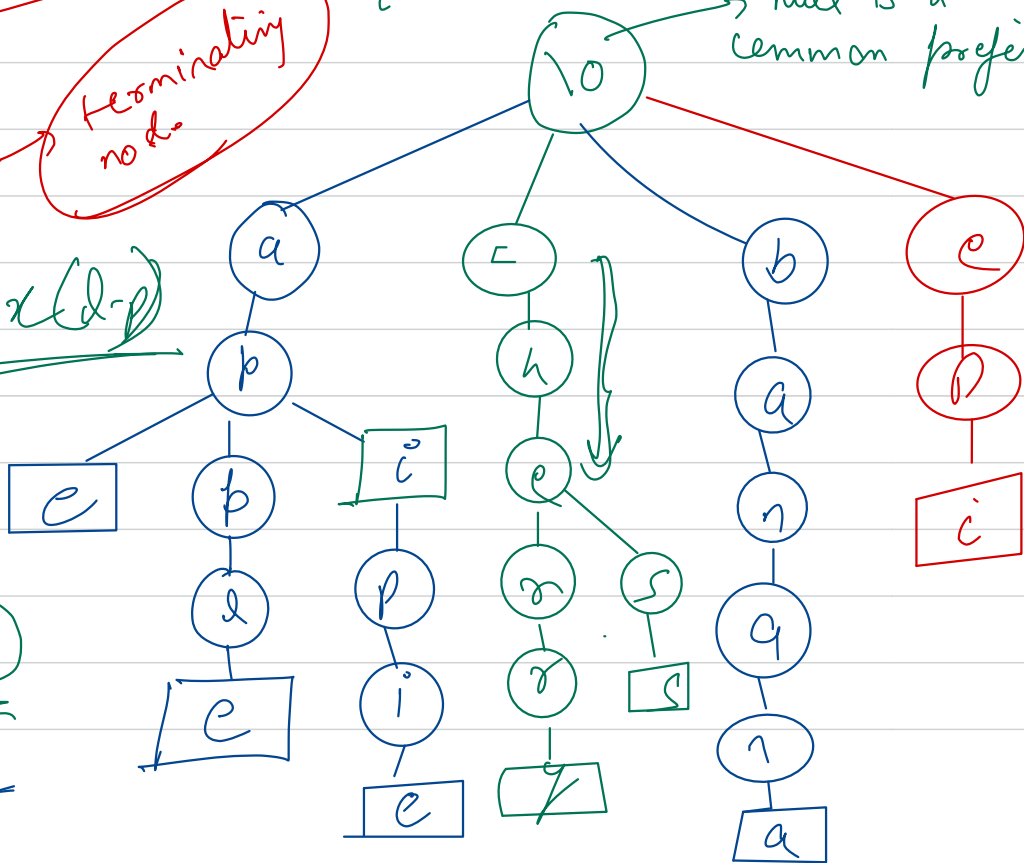
x x x

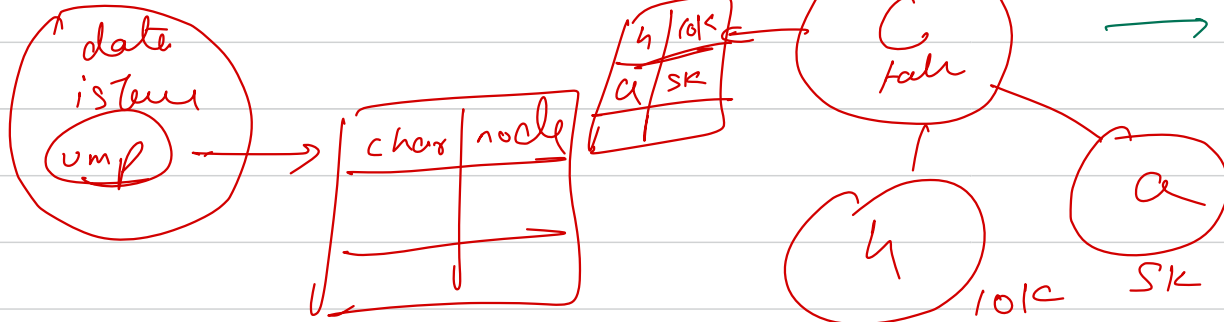
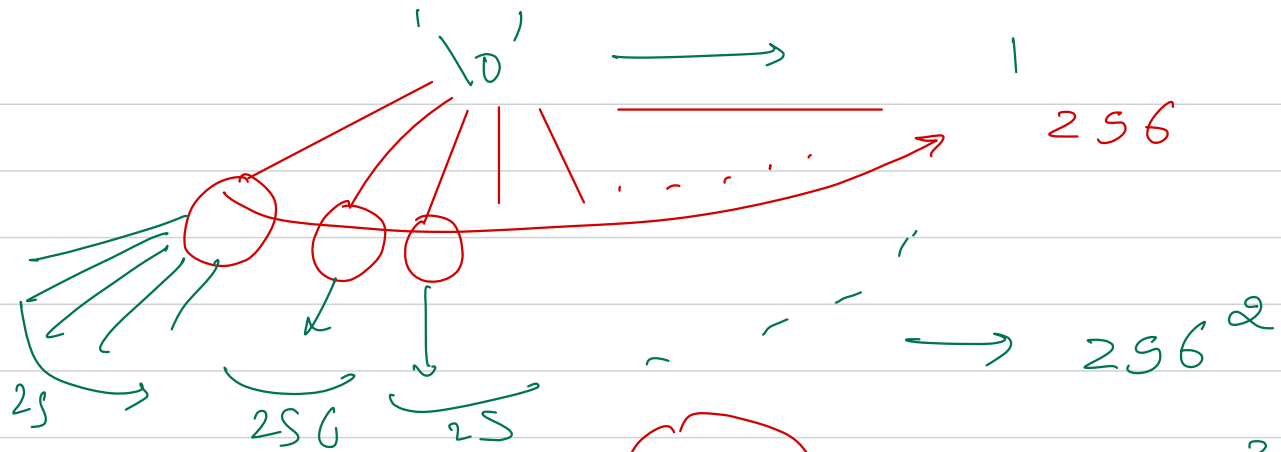
terminating node

$d(p) + x(d-p)$

DFS

api





$$SC \rightarrow O(256^2)$$

URL

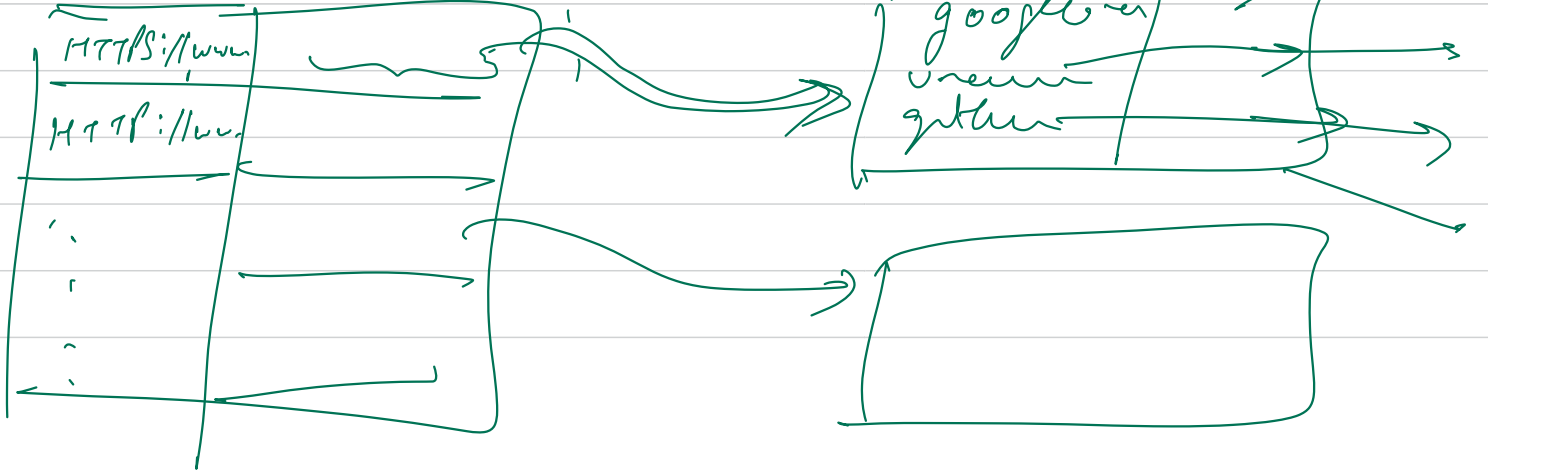
→ https://www.google.com/ corner

<https://www.unacademy.com/edu/career>

http://www.github.com

~~50%~~
49%

do → invariant



DNS

HTTP/
HTTPS/-

2
www.

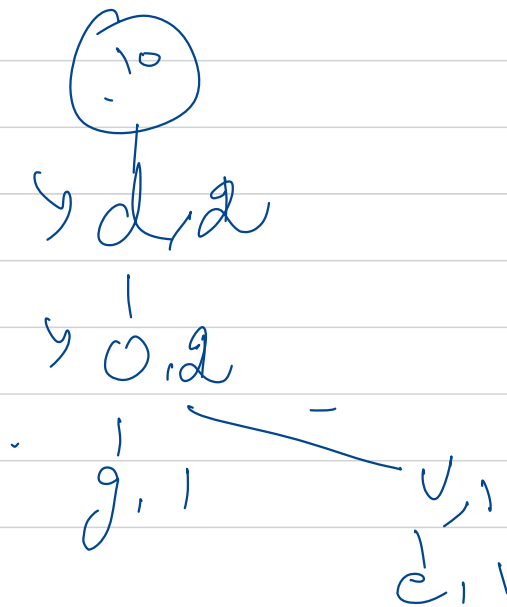
2
xyz.

,

gaglr
=
=

↪ [zebra, [¹dog, ²dove, duck]]
 z, dog, dov, du

↪ all story will
be using



→ for suffixes → we can ^{reverse} the strings & store in h.c.

Given N words, containing lowercase english alphabets
and a String S . find whether S can be formed
by combining two words from given set.

[bat, man, super, spider, iron, iron] ←

$S \rightarrow$ ironman

100

man

→ we can store all the strings in a trie → T_1
we will store all the strings in reverse form T_2

→ A_1 } → boolean arrays suffices
 A_2 } ironman

$A_1[i] \rightarrow S[0..i]$ exist or not in T_1

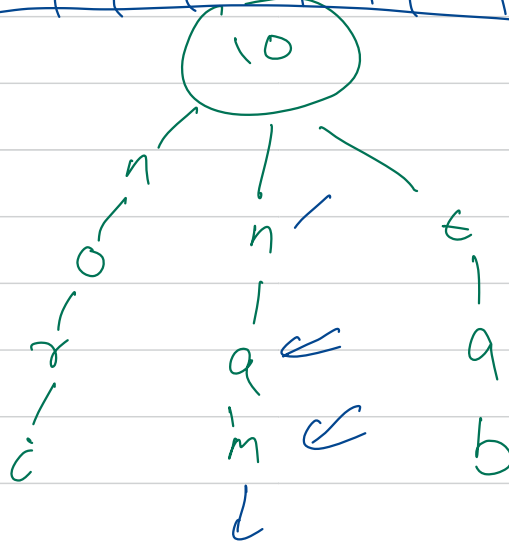
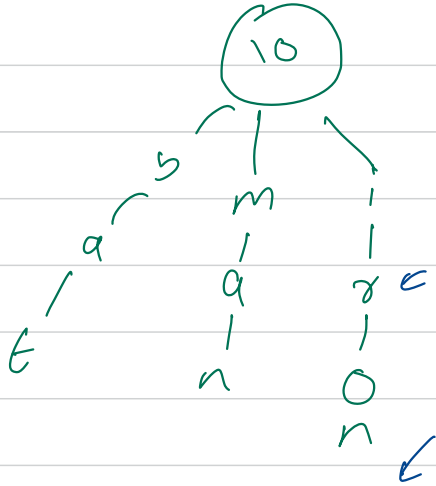
$A_2[i] \rightarrow S[i..n-1]$ (reversed) exist or not in T_2

keny

[bat, man, super, spider, iron, iron]

S → ironman

a_1 | T | T | T | T | F | F | F
 a_2 | F | F | F | F | T | T | T



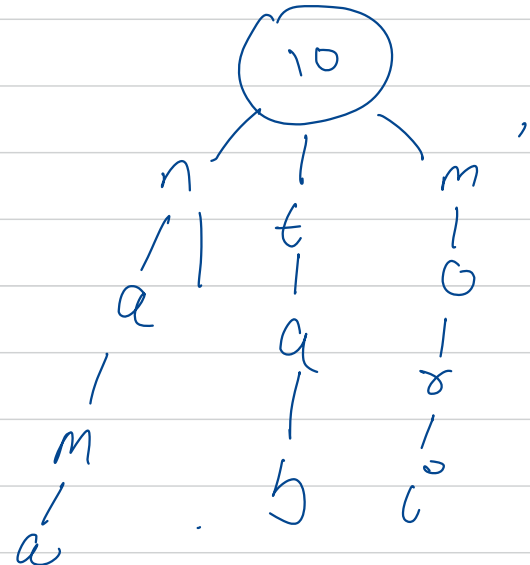
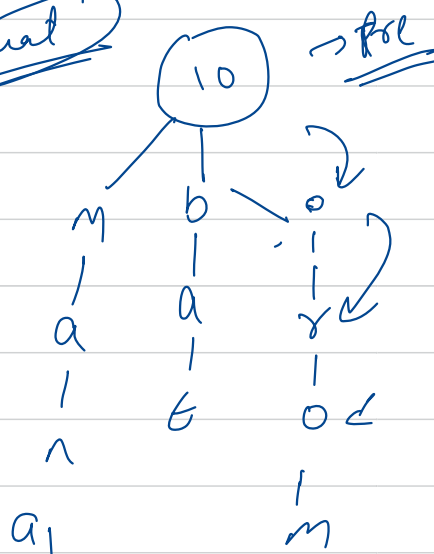
$A_1[i] == 104$
and $A_2[i+1] == 104$

Sawa $\underline{str} = \underline{ir}$ $O(nl + S)$

n [bat, man, seker, spider, iron, n man]

S → ironman temat
 $q \rightarrow O(S)$

xxx
 1 2 3 4 5 6 7
 [7 | 7 | 7 | 7 | 7 | 7 | 7]
 ironman
 [7 | 7 | 7 | 7 | 7 | 7 | 7]
 ironman
 [7 | 7 | 7 | 7 | 7 | 7 | 7]
 ironman



$[a_1, i] = \text{True}$ and $[a_2, i+1] = \text{True}$

we will meet at 8:52

$O(1)$

Save / lyru

$s = i$

$s + 2$

$i + 6$

$s + 0$
 n^2
150

$O(n)$

HM

~~iron man~~

$O(n)$

~~$c = 3$
 $s = 2$~~

$O(n^2)$



S = onnam

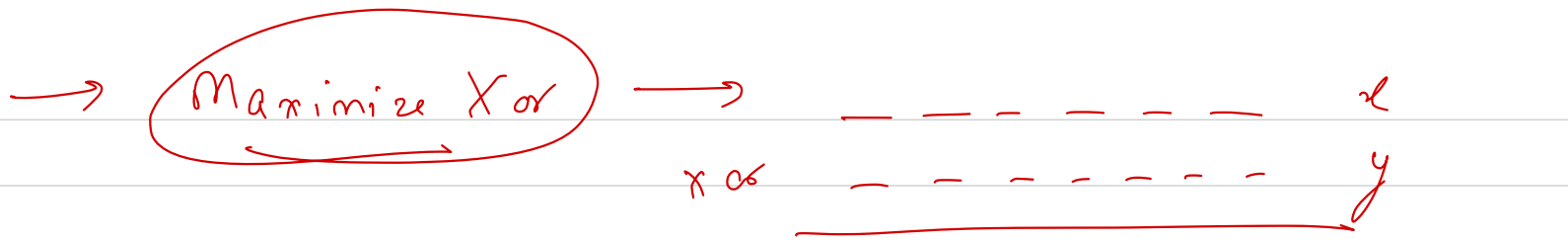
Qⁿ Given an array of integers, we have to find two elements whose bitwise XOR is max.

$(3, 10, 5, 25, 2, 8)$

ans $\rightarrow 28$

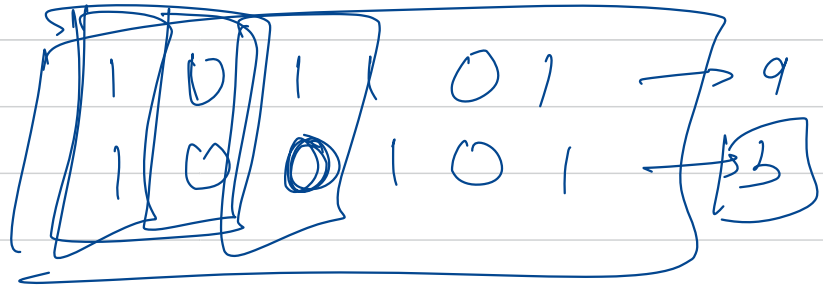
$$\underline{\underline{(5 \wedge 25)}}$$

$$\underline{\underline{7 \leq 10^6}}$$



we need to have ← as much as possible towards the MSB

| a | b | ans |
|---|---|-----|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

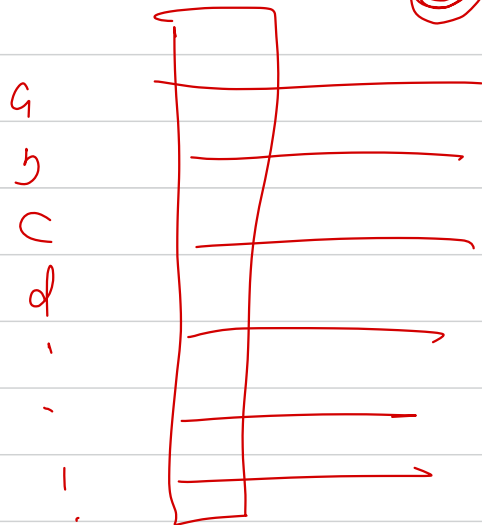


S bit

$x \rightarrow 3 \rightarrow 00011$

$y \rightarrow 10 \rightarrow 01010$

$z \rightarrow 5 \rightarrow 00101$



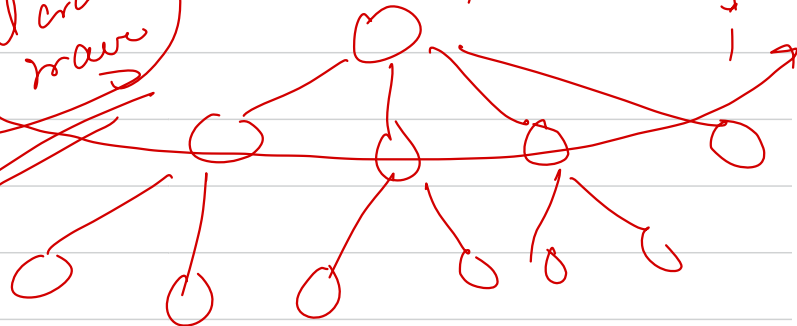
Stack / qwer



0011

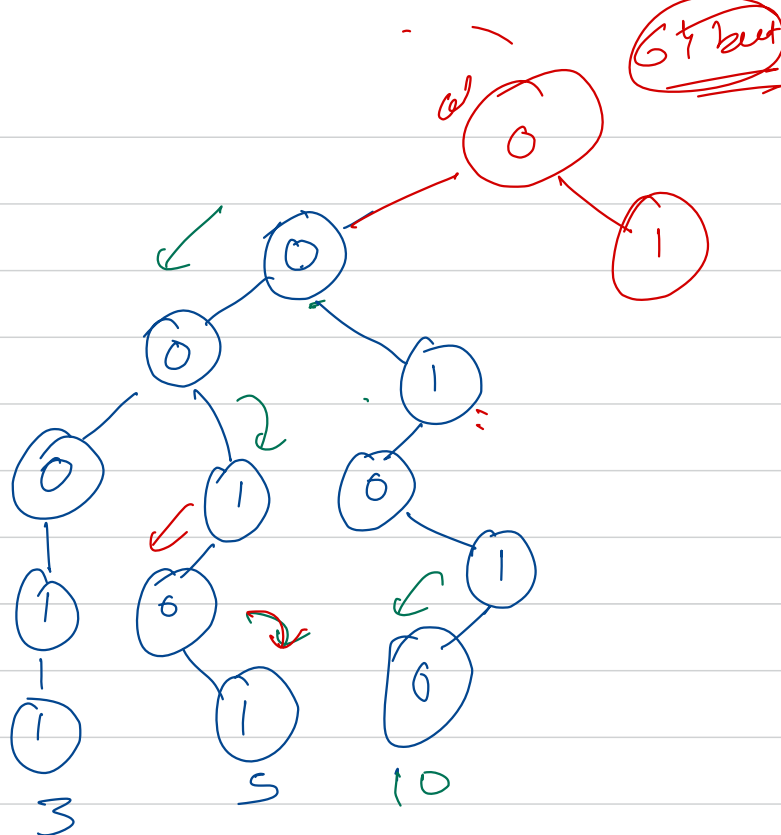


level order traverse



9 \rightarrow cm bit

Ans = 28.



64 best

↓ (5 bit)
[3, 10, 5, 25, 2, 8, 22]

3 \rightarrow 0 0 0 1 1

10 → 0 10 10

$S \rightarrow 00101$

28 → 11001

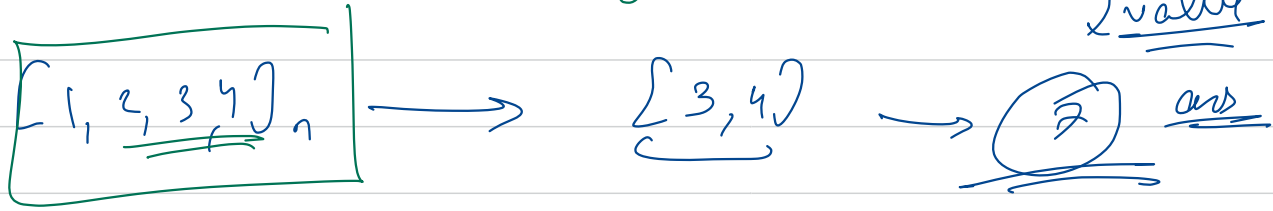
$2 \rightarrow 00010$

$8 \rightarrow 0, 1, 0, 0, 1$

$27 \rightarrow 11011$

$O(n)$

Qⁿ Given an array of integers, find the
max xor subarray.



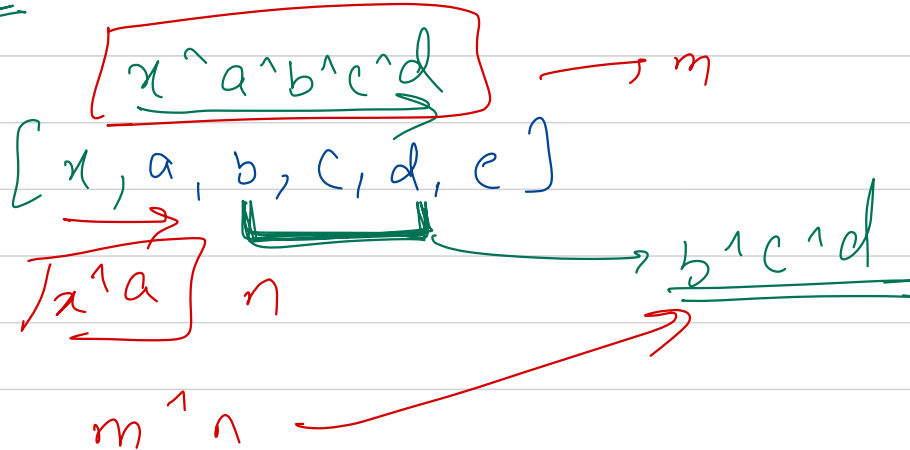
$n \leq 10^6$

$$\underline{\underline{A(x, y)}} = f(1, y) \wedge f(1, x-1)$$

returns xor
of elements
from index
 x to y

prefix
xor till
 y

prefix xor till
 $x-1$



$[a, b, c, d, e, f]$
 $\downarrow \quad \downarrow \quad \quad \quad \downarrow$
 max sub array

$O(n)$
 \rightarrow

$f \rightarrow [a, a^1b, \underbrace{a^1b^1c}_m, a^1b^1c^1d, \underbrace{a^1b^1c^1d^1e}_n, a^1b^1c^1d^1e^1f]$

Max xor pair

$\rightarrow m^1n = \underline{\underline{d^1e}}$

$[2, 3, 4, 5]$

$[2, 2^13, 2^13^14, 2^13^14^15]$

$[2, 1, 1, 5, 0]$

Qⁿ Given an array, find count of subarrays
with xor less than k.

[8, 9, 10, 11, 12]

$n \leq 10^6$

$k = 3$

ans \rightarrow

[8, 9]

↓

2

[9, 10]

↓

[10, 11]