3.9 - Hashing - 4

Saturday, July 26, 2025 10:38 AM

→ min window substring

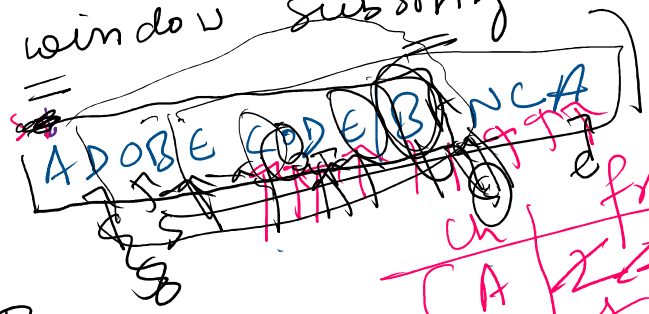
→ equal freq ↳ keys

→ LRU cache

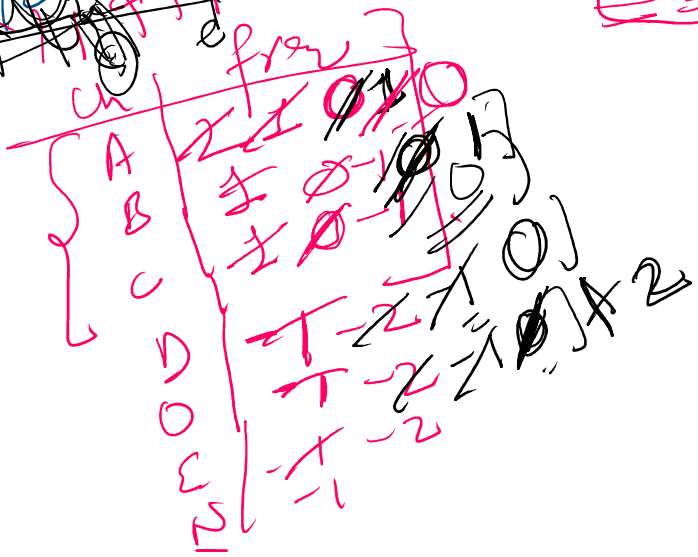
t = AABC

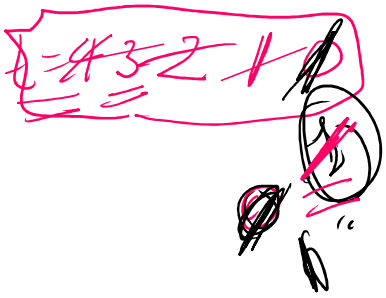
k = 4

Min window substring



S:





O(S) = ?

#

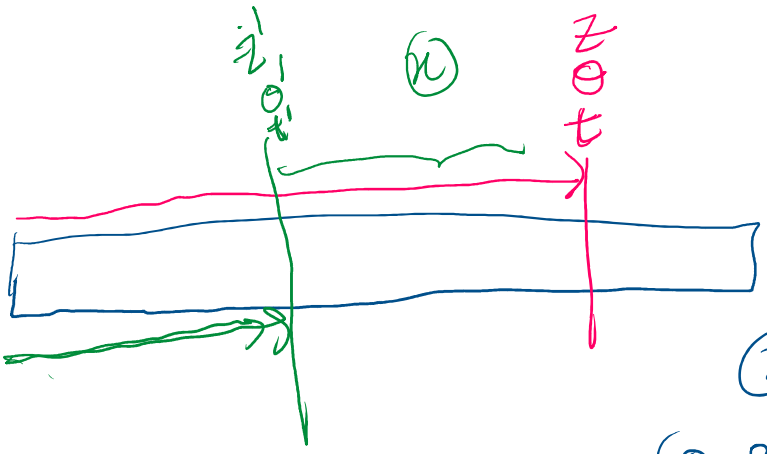
M1: Arrays (1D, 2D) | ArrayList, Strings, Sets

M2: Recursion, Sorting, Backtracking, DSF, LL, Two Pointers

M3: Binary Search, Hashing

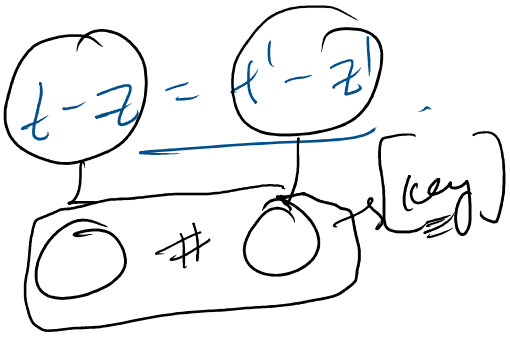
Longest equal Freq of 0s, 1s, 2s

Longest



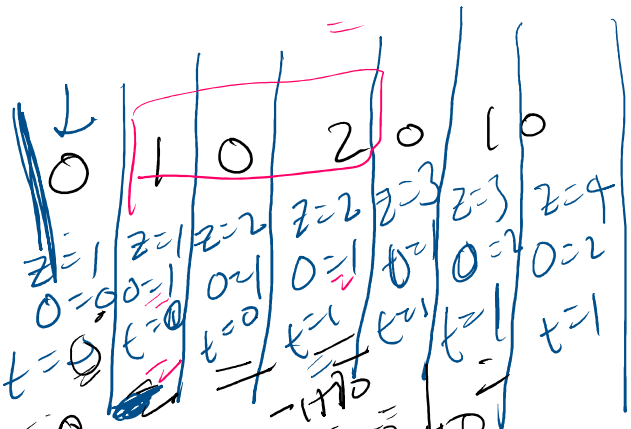
$z - z' = x$
$o - o' = x$
$t - t' = x$

$t - z = t' - z'$



② − ①

$(o - o') - (z - z') = 0$
$o - o' = z - z'$
$o - z = o' - z'$
$t - o = t' - o'$



$-1 \# 0$

$-1 \# 0 \to 0$
$0 \# -1 \to 1$
$-1 \# -1 \to 2$
$-2 \# 0 \to 4$

$-1 \#$

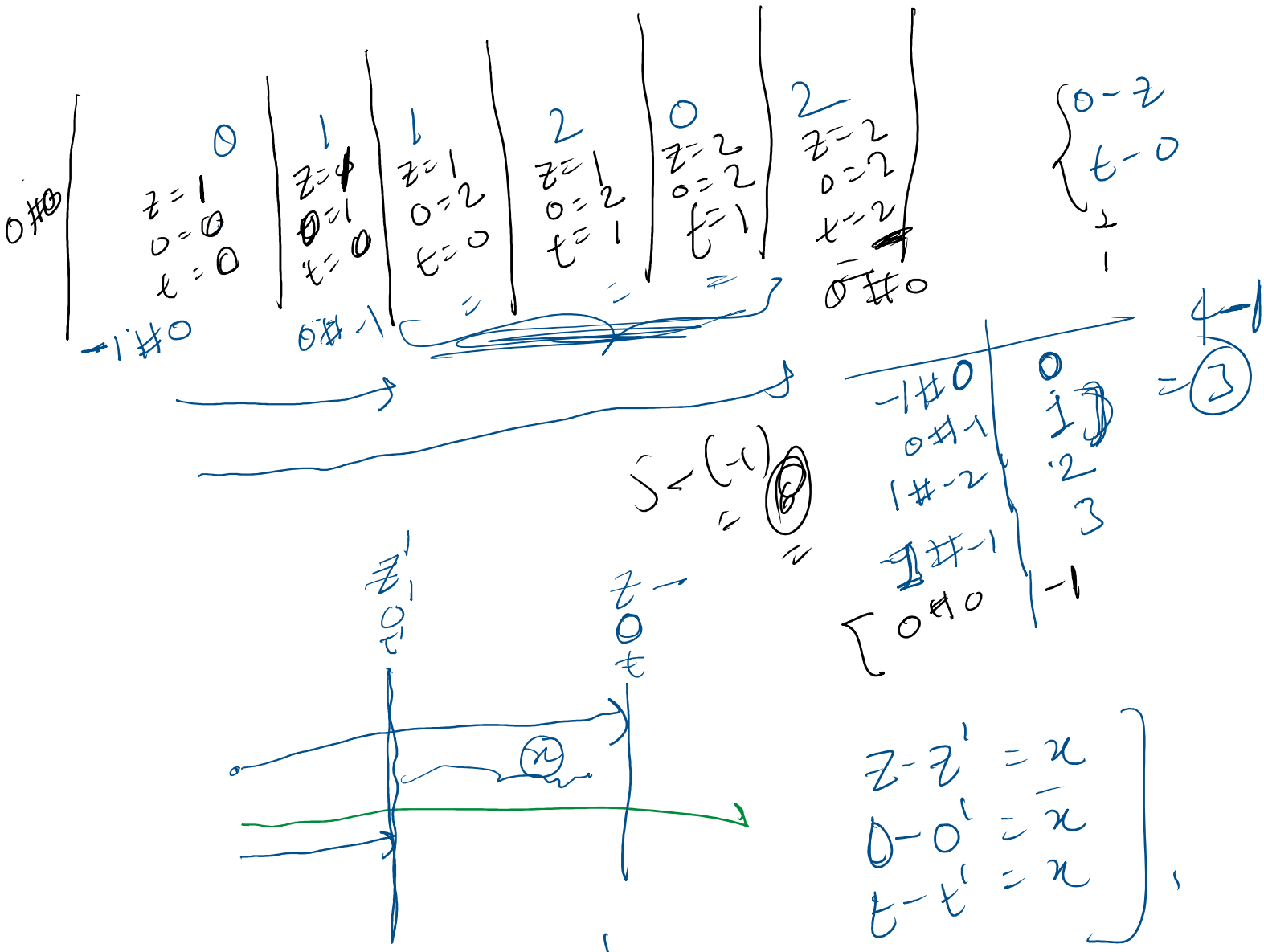
③ $2 \# 0$

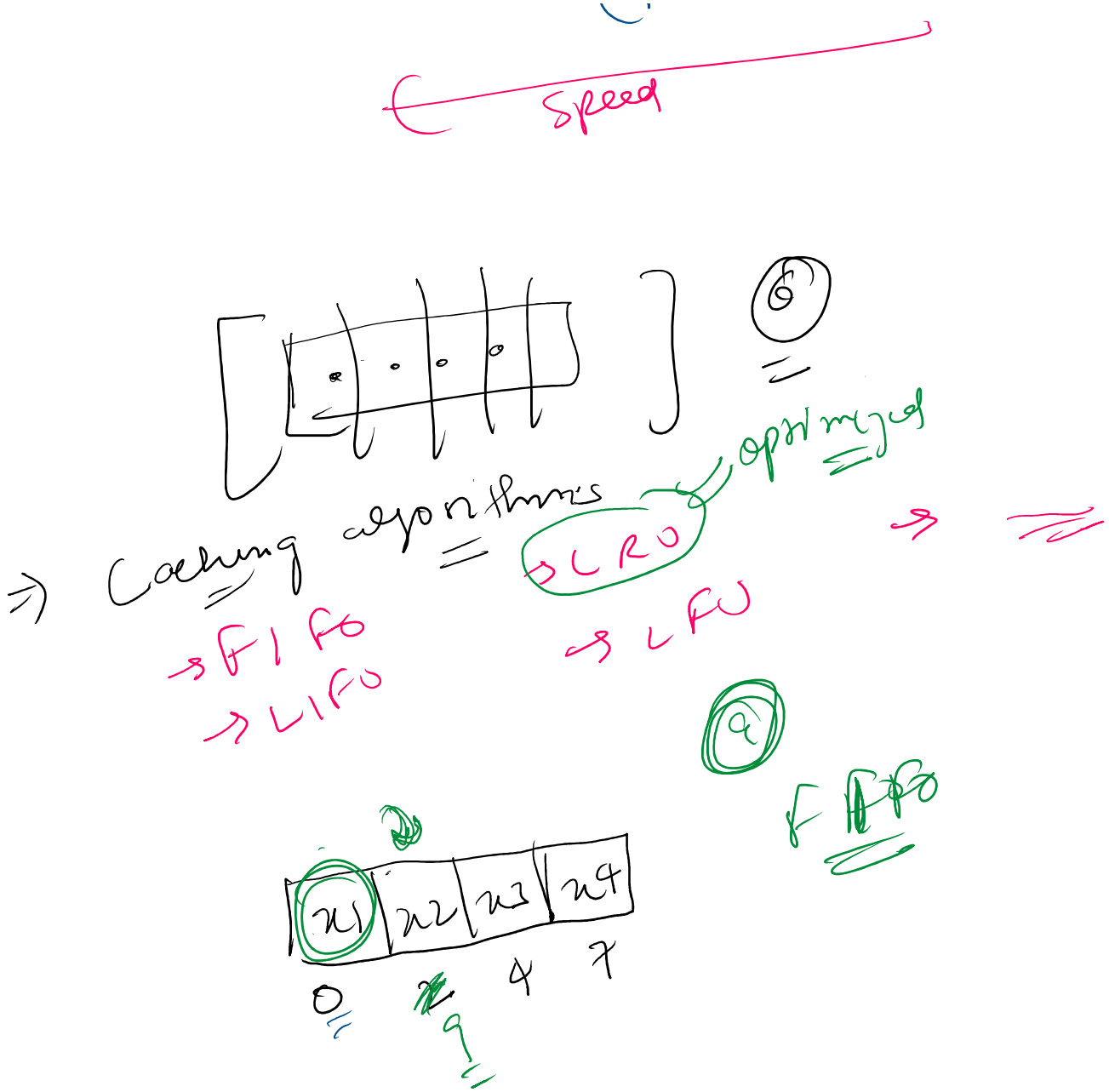
$\begin{cases} o - t = o' - z' \\ t' - o' = t - o \end{cases}$

$= o - o' = z - z'$
$= t - t' = o - o'$

$\begin{cases} o - o' = x \\ t - t' = x \\ z - z' = x \end{cases}$

$3 - 0$


0#0
z=1
o=0
t=0
1#0
1
z=1
o=0
t=0
0#1
2
z=1
o=2
t=1
0
z=2
o=2
t=1
2
z=2
o=2
t=2
0#0
o-z
t-o
1
1
-1#0
0#-1
1#-2
-1#-1
0#0
0
1
2
3
-1
4
3
z'
o'
t'
z
o
t
x
z-z' = x
o-o' = x
t-t' = x
z-z' = o-o'
z-o = z'-o'
z-o = z'-o'
o-t = o'-t'
o-o' = t-t'
o-t = o'-t'
Cache
Cache > Primary > Secondary
(RAM


Speed
Caching algorithms
FIFO
LIFO
LRU
LFU
optimized
FIFO
0
2
4
7