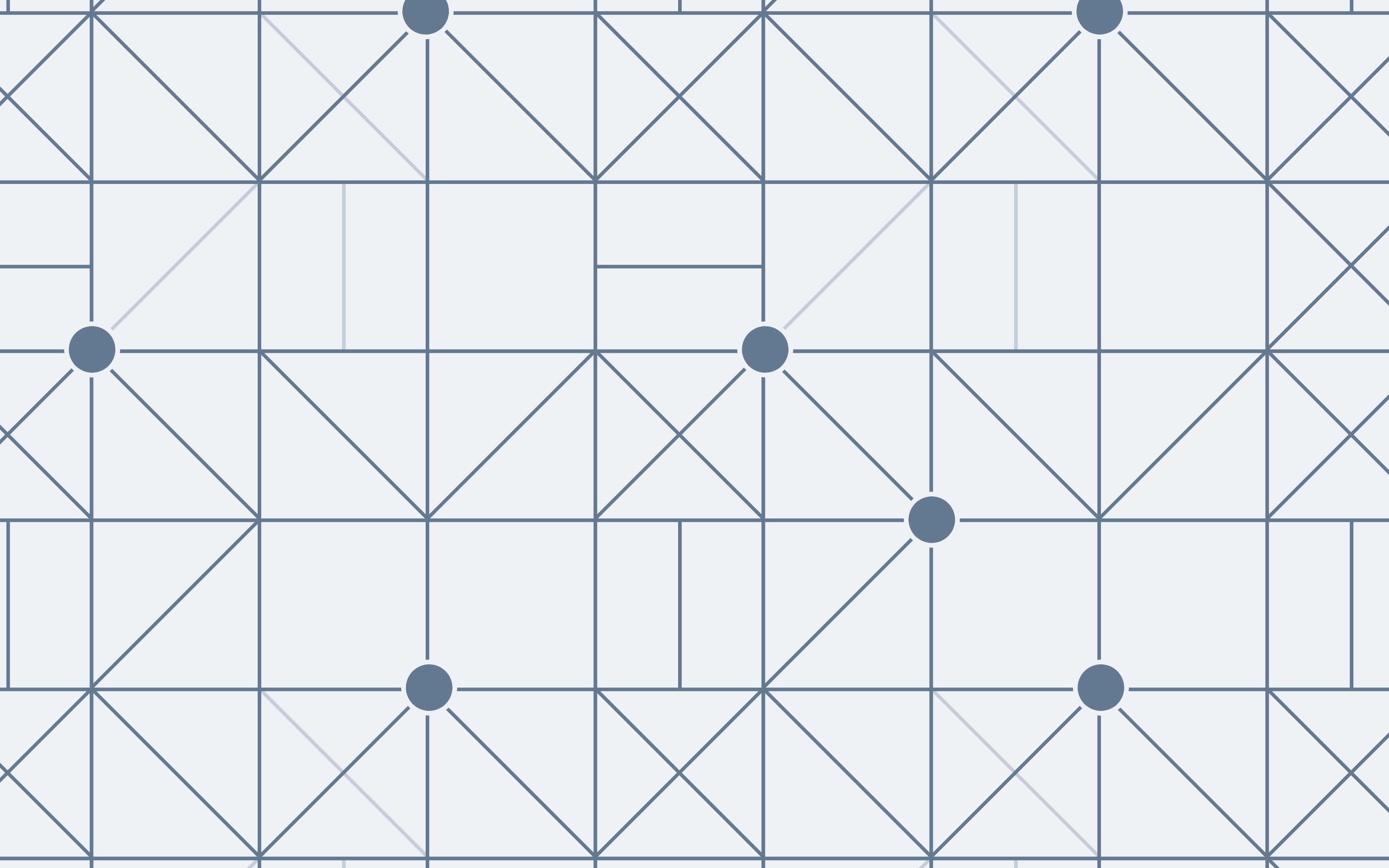


Count Number of Pairs with absolute diff. K

int[] arr = {5, 10, 25, 15, 20, 25}   K = 5

(5, 10) (10, 15) (25, 20)
(15, 20)
(20, 25)

(x, y)

$y = 5$
$x = y + k = 10$
$= y - K = 0$

$y = 10$
$x = y + k = 15$
$= y - K = 5$

$y = 25$
$x = 30$
$x = 20$

num	freq
20	1
5	1
10	1
25	1
15	1

$y = 25$
$x = 30$
$x = 20$

$y = 15$
$x = 20$
$x = 10$

$y = 20$
$x = 25$
$x = 15$

count = $\cancel{0}\ \cancel{1}\ \cancel{2}\ \cancel{3}\ \cancel{4}\ 5$

int[] arr = { 1 , 2 , 1 , 2 , 2 , 2,3}   K = 0

{(1, 1) (2, 2)}

freq

K = 0

→ 1 ⟶ 2

→ 2 ⟶ 4

3 ⟶ 1

$\left.\begin{array}{l} y = 1 \\ x = 1 \end{array}\right\}$

$\left.\begin{array}{l} y = 2 \\ x = 2 \end{array}\right\}$

$\{3, 4, 5, 2, 1, 4, 5\}$ $k = 1$

$(3, 4)$
$(4, 5)$
$(2, 3)$
$(1, 2)$

$3 \longrightarrow 1$
$4 \longrightarrow 2$
$5 \longrightarrow 2$
$2 \longrightarrow 1$
$1 \longrightarrow 1$

$\text{count} = \cancel{0}\,\cancel{1}\,\cancel{2}\,\cancel{3}\,4$

(x, y)

$y = 2$
$x = 3$

$y = 3$
$x = y + k = 4$

$y = 1$
$x = 2$

$y = 4$
$x = 5$

$y = 5$
$x = 6$

Roll Number Problem

Agenda

1. group anagrams
2. Minimum window substring
3. Distinct windows
4. Substring with K unique characters.

Group Anagrams.

$$\text{string[]} = \left\{ \begin{array}{ccccc} 0 & 1 & 2 & 3 & 4 \\ \boxed{\text{act}}, & \text{tac}, & \text{god}, & \text{dog}, & \text{cat} \end{array} \right\}$$

{act, tac, cat} { god, dog }

Brute Force

TC: $O(N \times N \times M) \approx O(N^2 M)$

SC: $O(1)$

M → length of string

N → length of array.

$$\text{String[]} = \{\underset{\uparrow}{\overset{0}{\text{act}}},\ \underset{\uparrow}{\overset{1}{\text{tac}}},\ \underset{\uparrow}{\overset{2}{\text{god}}},\ \underset{\uparrow}{\overset{3}{\text{dog}}},\ \boxed{\underset{\uparrow}{\overset{4}{\text{cat}}}}\}$$

$$\left.\begin{array}{l} TC : O(N \times N \times M) \\ SC : O(N) \end{array}\right\}$$

Hash Map

Key	Value
act	{act, tac, cat}
god	{god, dog}

$$\begin{array}{lccccc} & 0 & 1 & 2 & 3 & 4 \\ \text{String[] = } \{ & \text{act}, & \text{tac}, & \text{god}, & \text{dog}, & \text{cat} \ \} \\ & \uparrow & \uparrow & \uparrow & \uparrow & \uparrow \end{array}$$

Hash Map

Key grp_name	Value List of group
act	{act, tac, cat}
dgo	{god, dog}

Sort(str)

dgo act

TC: $O(N \times M \times \log_2 M)$

SC! $O(N)$

	0	1	2	3	4
String[] =	{act,	tac,	god,	dog,	cat}
	10k	12k	13k		

a → 1
c → 1
t → 1 }

g → 1
o → 1
d → 1 }

Hash Map

Key	Value
10k ~~a → 1~~ ~~c → 1~~ ~~t → 1~~	{act} {act, tac, cat}
12k g → 1 o → 1 d → 1	{tac} {god, dog}

act, tac, cat

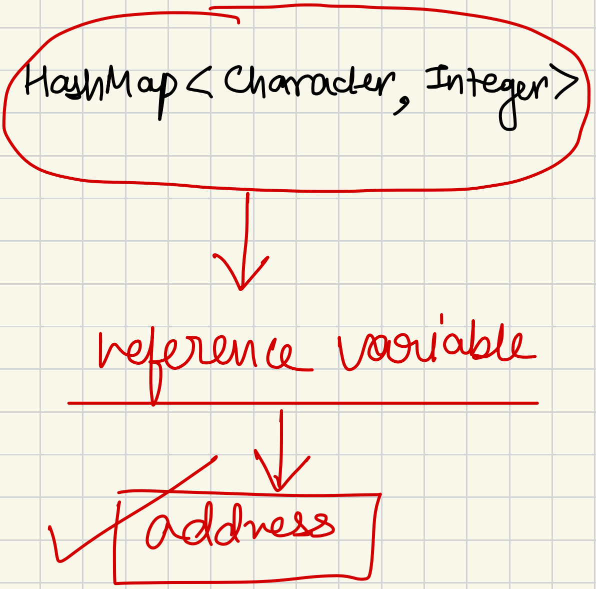
fmap

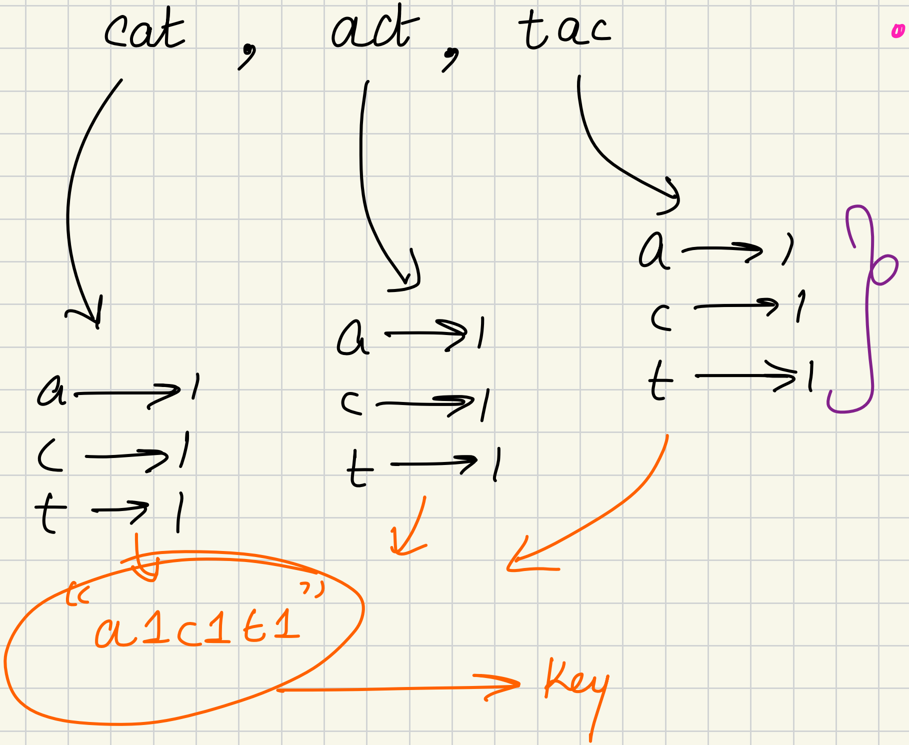
a → 1
c → 1
t → 1 }

TC : O(N×M)

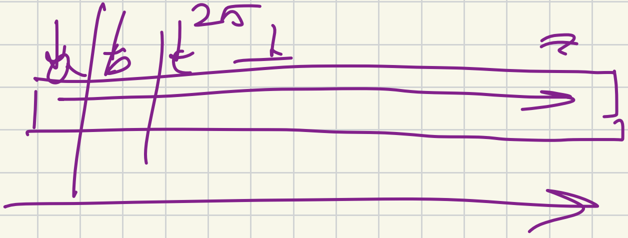
SC : O(N)

HashMap<HashMap<Character, Integer>, ArrayList<String>>





- Somehow keys are sorted.



$O(25) = O(1)$ ✓

Minimum window Substring

str1 = " d b e a c d b c c a b "

str2 = " a b b c d c "

a → 1
b → 2
c → 2
d → 1

Brute force

↳ generate fmap of all substring of str1
try to accumulate str2 in it.

TC : $O(N^2 \times M)$
SC : $O(1)$

N → len of str1
M → len of str2

exc

str1 = " d b e a c d b c c a b " inc

str1.substring(exc+1, inc+1)

ans = ~~beacdbc~~

dbccab

str2 = " a b b c d c "

TC : O(N+M)

SC : O(1)

fmap2

a →	1
b →	2
c →	2
d →	1

Contained?

fmap1

b →	~~1~~ 2
a →	1
c →	~~1~~ 2

inc
↓

str1 = " d b e a c d b c c a b "

↑
exc

str2 = " a b b c d c "

{ TC: O(N+M)
SC: O(1)

dmct = 6

mct = ~~0~~ ~~1~~ ~~2~~ ~~3~~ ~~4~~ 5

fmap 2

a → 1
c → 2
b → 2
d → 1

fmap 1

b → ~~1~~ 2

a → 1
c → ~~1~~ 2