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Problem Solving

Course on Data Structure

Pankaj Sharma • Lesson 6 • July 14, 2024

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CS & IT Engineering

Data Structure

Arrays- IV

Lecture Number- 06

By- Pankaj Sir

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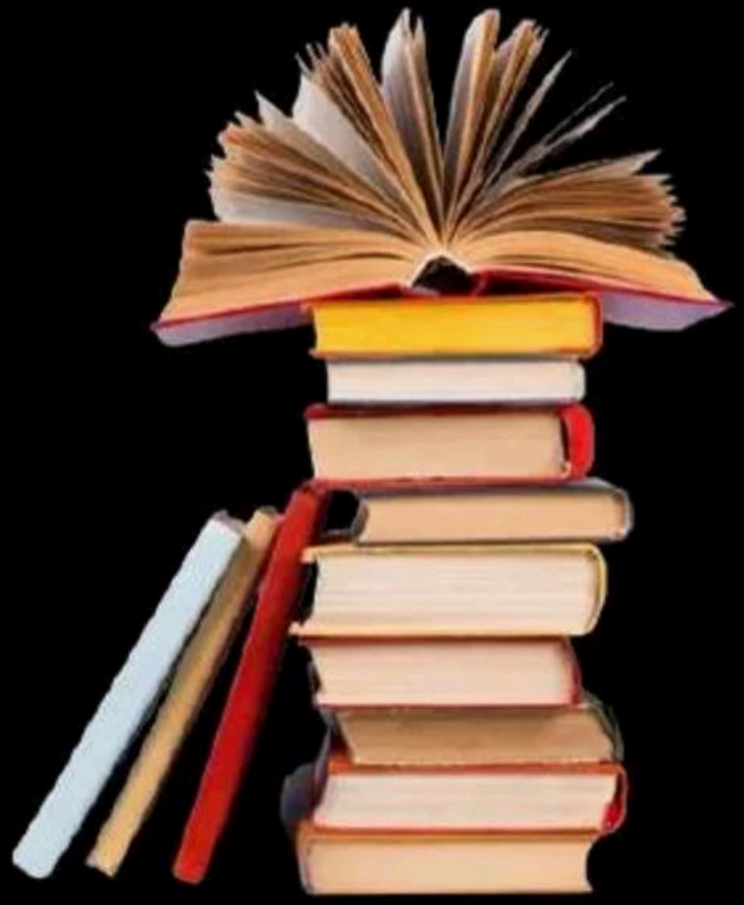
Topics

to be covered



1. Arrays

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CMO

Lower Triangular Matrix

Add(a_{53})

Cols already filled

= col1, col2

(5 + 4) = 9

	1	2	3	4	5
1	A_{11}	0	0	0	0
2	A_{21}	A_{22}	0	0	0
3	A_{31}	A_{32}	A_{33}	0	0
4	A_{41}	A_{42}	A_{43}	A_{44}	0
5	A_{51}	A_{52}	A_{53}	A_{54}	A_{55}

A_{11}	A_{21}	A_{31}	A_{41}	A_{51}	A_{22}	A_{32}	A_{42}	A_{52}	A_{33}	A_{43}	A_{53}	A_{44}	A_{54}	A_{55}

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CMO

Lower Triangular Matrix

Add(a_{53})

Within 3rd col. ele already filled before a_{53} = (5-3) = 2 ele

Cols already filled = col1, col2 → (5 + 4) = 9

	1	2	3	4	5
1	A_{11}	0	0	0	0
2	A_{21}	A_{22}	0	0	0
3	A_{31}	A_{32}	A_{33}	0	0
4	A_{41}	A_{42}	A_{43}	A_{44}	0
5	A_{51}	A_{52}	A_{53}	A_{54}	A_{55}

A_{11}	A_{21}	A_{31}	A_{41}	A_{51}	A_{22}	A_{32}	A_{42}	A_{52}	A_{33}	A_{43}	A_{53}	A_{44}	A_{54}	A_{55}

CMIO

$\text{Cost}(a_{ij})$

cols already filled

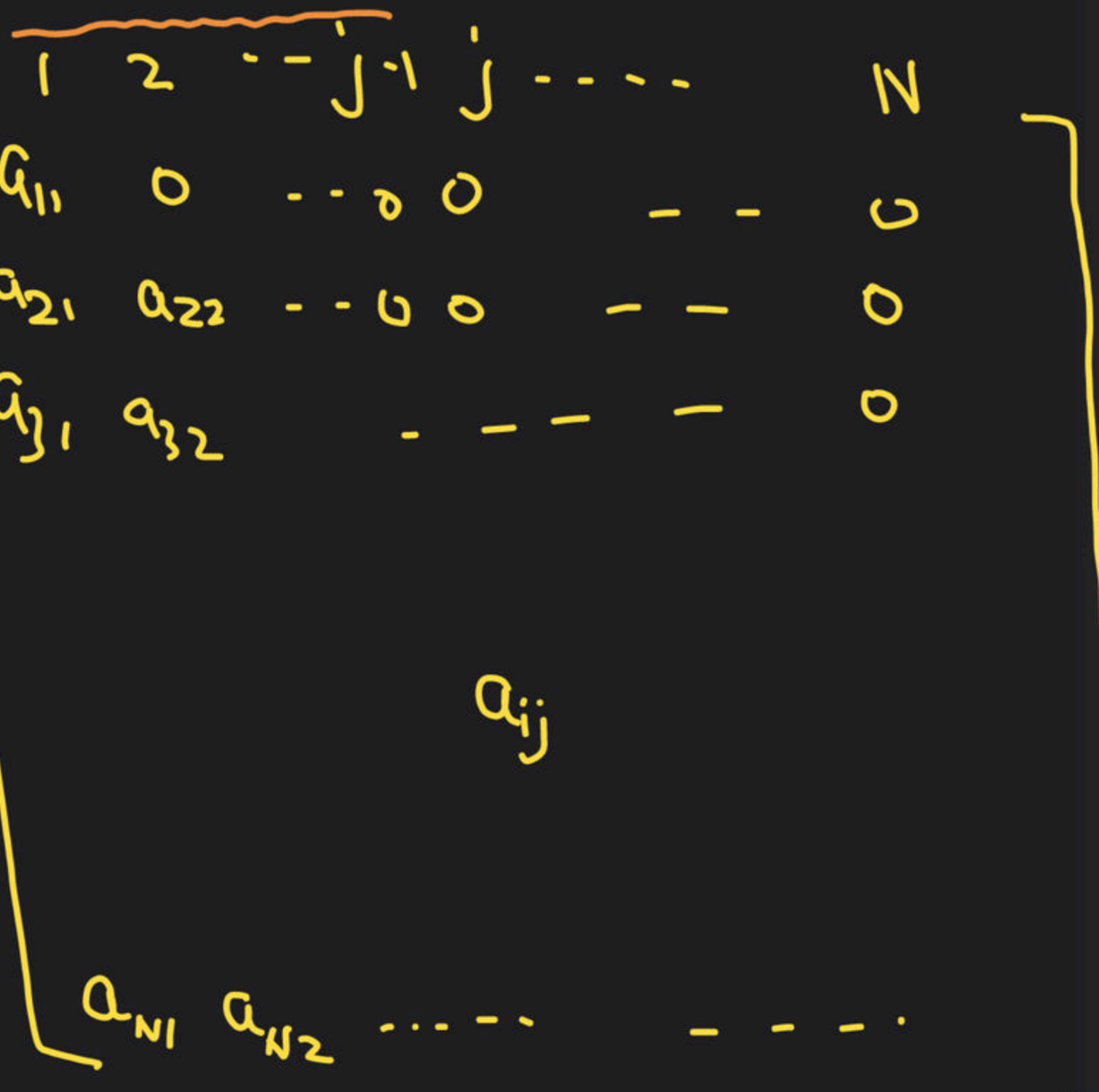
: col1, col2, col3, ... col j-1

$1^{st}_{col} = N = N-(1-1)$

$2^{nd}_{col} = N-1 = N-(2-1)$

$3^{rd}_{col} = N-2 = N-(3-1)$

$(j-1)_{col} = N-(j-1-1)$



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$$\left[N + (N-1) + (N-2) + \cdots + (N-j+2) \right]$$

1st

last

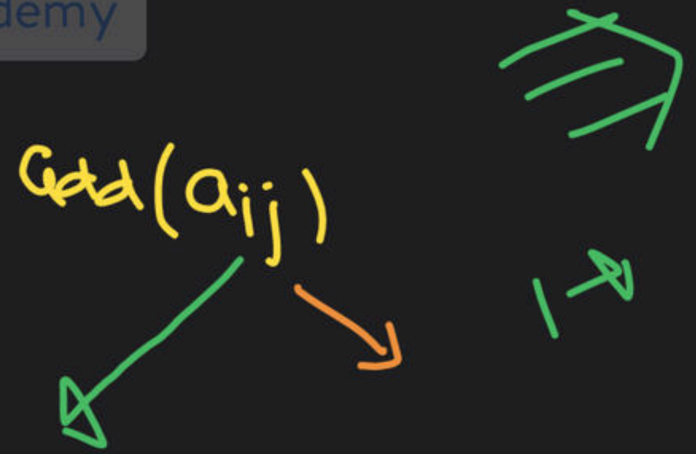
$$S_n = \frac{n}{2}\left[T_1 + l \right]$$

$$\Rightarrow \quad \frac{j-1}{2}\left[N + N - j + 2 \right]$$

$$= \frac{(j-1)}{2}\left[2N-(j-2)\right]$$

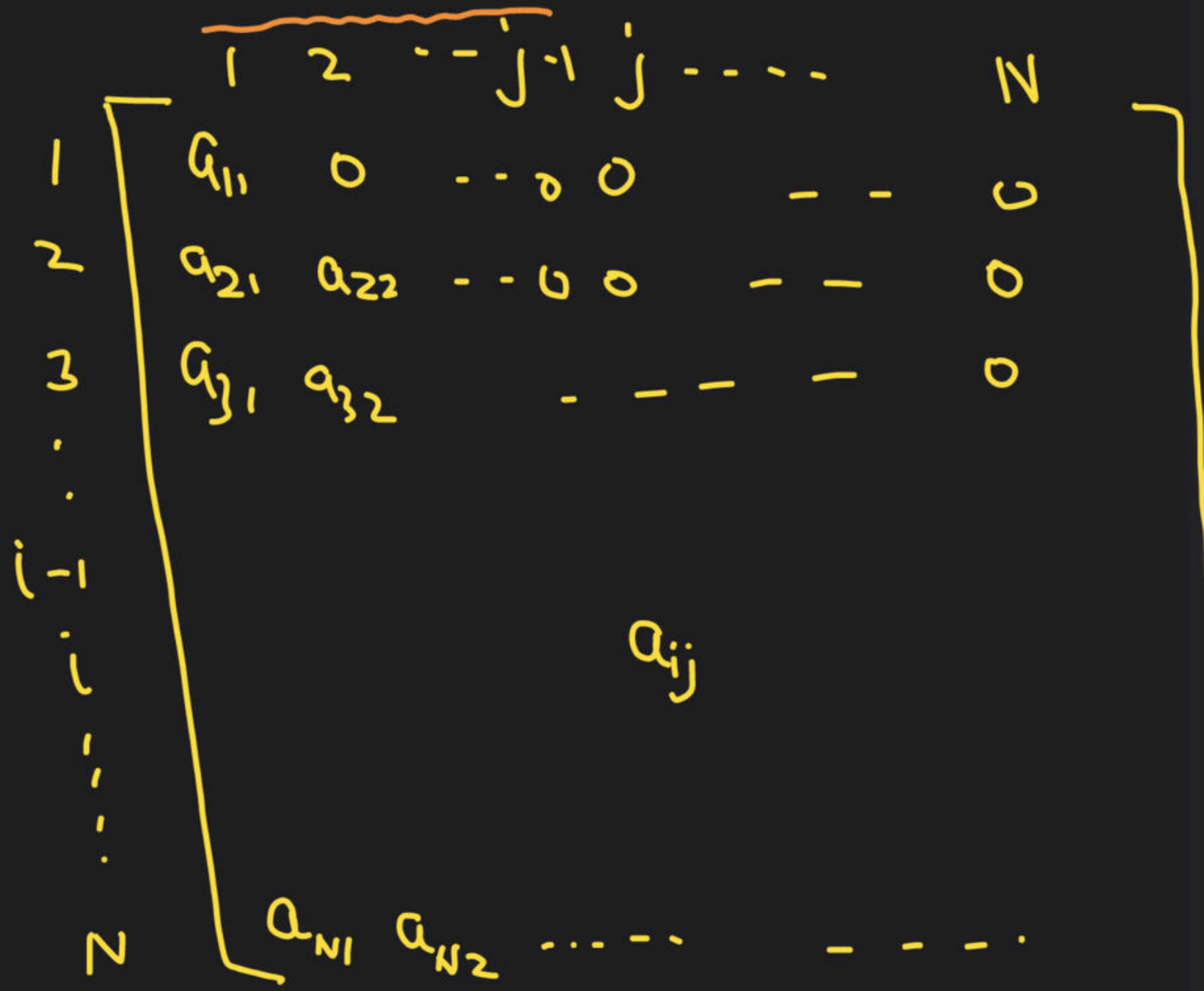
$$= (j-1)\cdot N - \frac{(j-1)(j-2)}{2}$$

CM10



within jth col, ele before Aij

= (i-j)



Total elc. already filled before a_{ij}

$$= (i-j) + (j-1)N - \frac{(j-1)(j-2)}{2}$$

Q LTM $A[1..100][1..100]$

CMG $BA = 1000$
$w = 2$ byte

$\text{addr}(A[50][43])$

within target col
ele. already filled
$= 50 - 43$
$= 7$ ele.

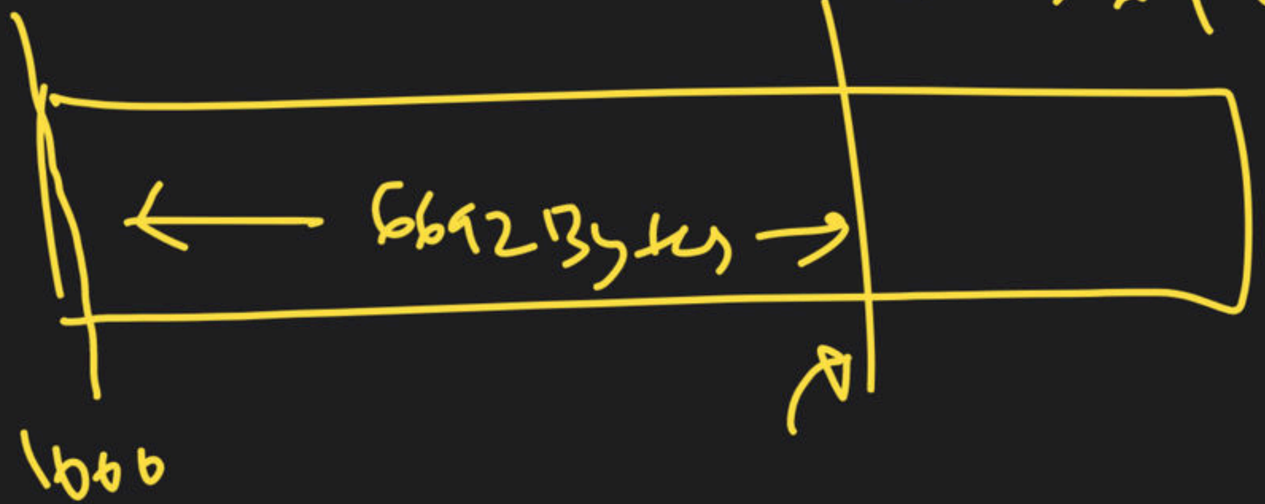
cols already filled
1, 2, 3, ... 42
$100 + 99 + 98 + \cdots + 59$
$= \frac{42}{2}[100 + 59] = 21 \times 159$
$= 3339$

Total ele. already filled $= 3339 + 7 = 3346$ elements

Memory already filled before $A_{50,43}$

$= 3346 \times 2$

$= 6692$ Bytes



$\text{add}(A_{50,43}) = 1000 + 6692$

$= 7692$

Q2. LTRM

$A[-20..20][-20..20]$

$20-(-20)+1$

41×41

CMO

$w = 1$ byte, $BA = 1000$

add $(A[-2][-6])$

Addr $(A[-2][-6])$

$-7-(-20)+1$

$= 14$ cols

$[41 + 41^2 + 41^3 + \cdots + 41^{14}]$

$$\left[41 + 40 + \cdots + 28\right]$$

$$\frac{14}{2}\left[41 + 28\right] = 7 \times 69 = 483 \text{ ele.}$$

Q2. LTRM

$A[-20..20][-20..20]$

$20-(-20)+1$

41×41

CMO

ω = 1 byte, BA = 1000

add $(A[-2][-6])$

Addr $(A[-2][-6])$

within col index -1

$-2-(-6)+1 = 4$ ele.

$-20, -19, \ldots -8, -7$

$-7-(-20)+1$

$= 14$ cols

$[41 + 41 + 40 + 39 + \ldots + 28]$ (1, 2, 3, 14)

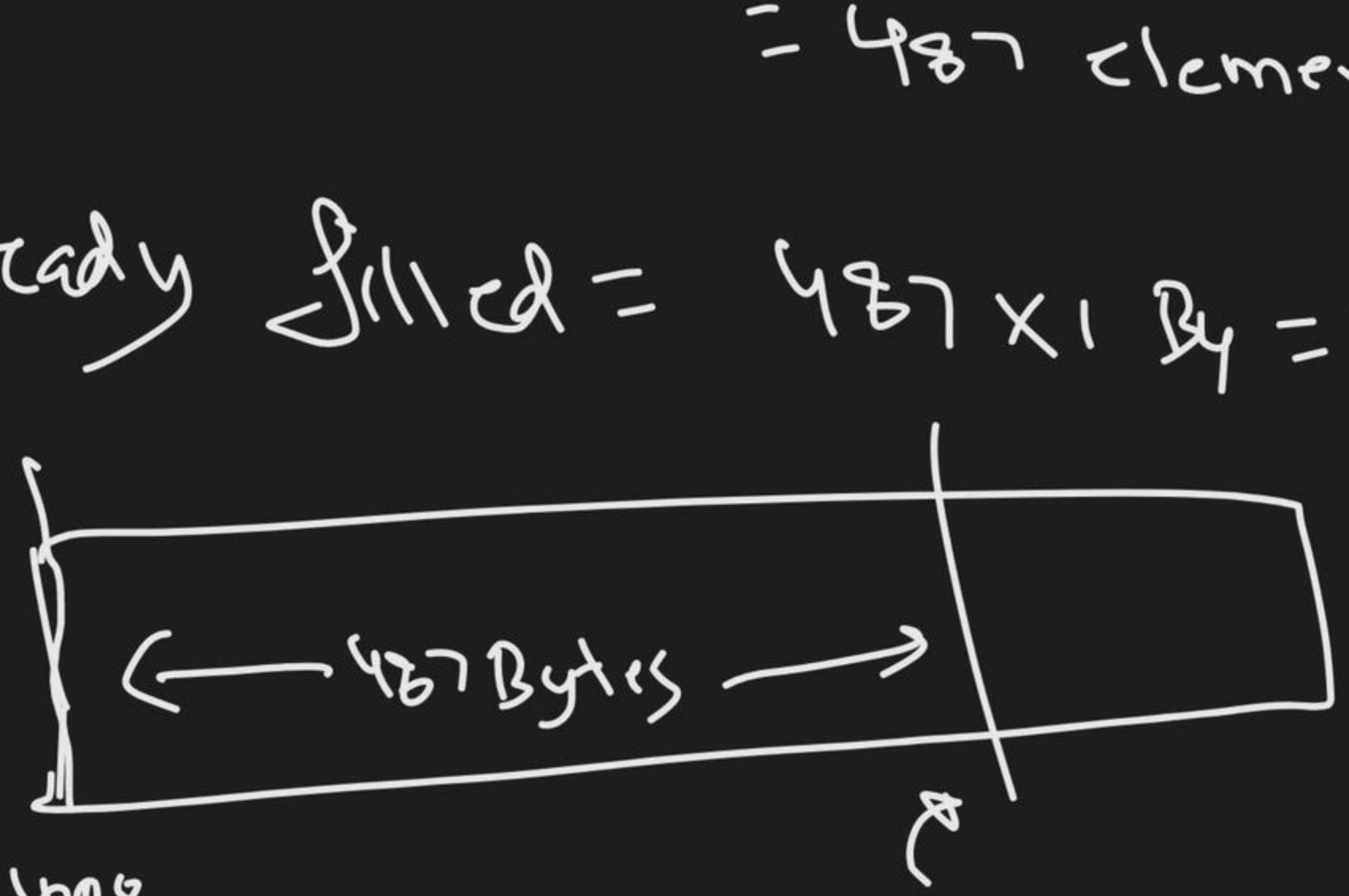
Total ele. already filled = 483 + 4

= 487 elements

Memory already filled = 487 × 1 B = 487 Bytes

1000 + 487

= 1487



LTM

A[-3..3][-5..1] w = 2 bytes, BA = 1000

CM6

adta($a_{3,-1}$)

90.1. → wrong answer?

{ 1052
1664
1676 } formula Niptaa dega

Exam main

using formula

$a_{3,-1}$

within col index

-1

= 3 - (-1) = 4

26 elem

cols already filled

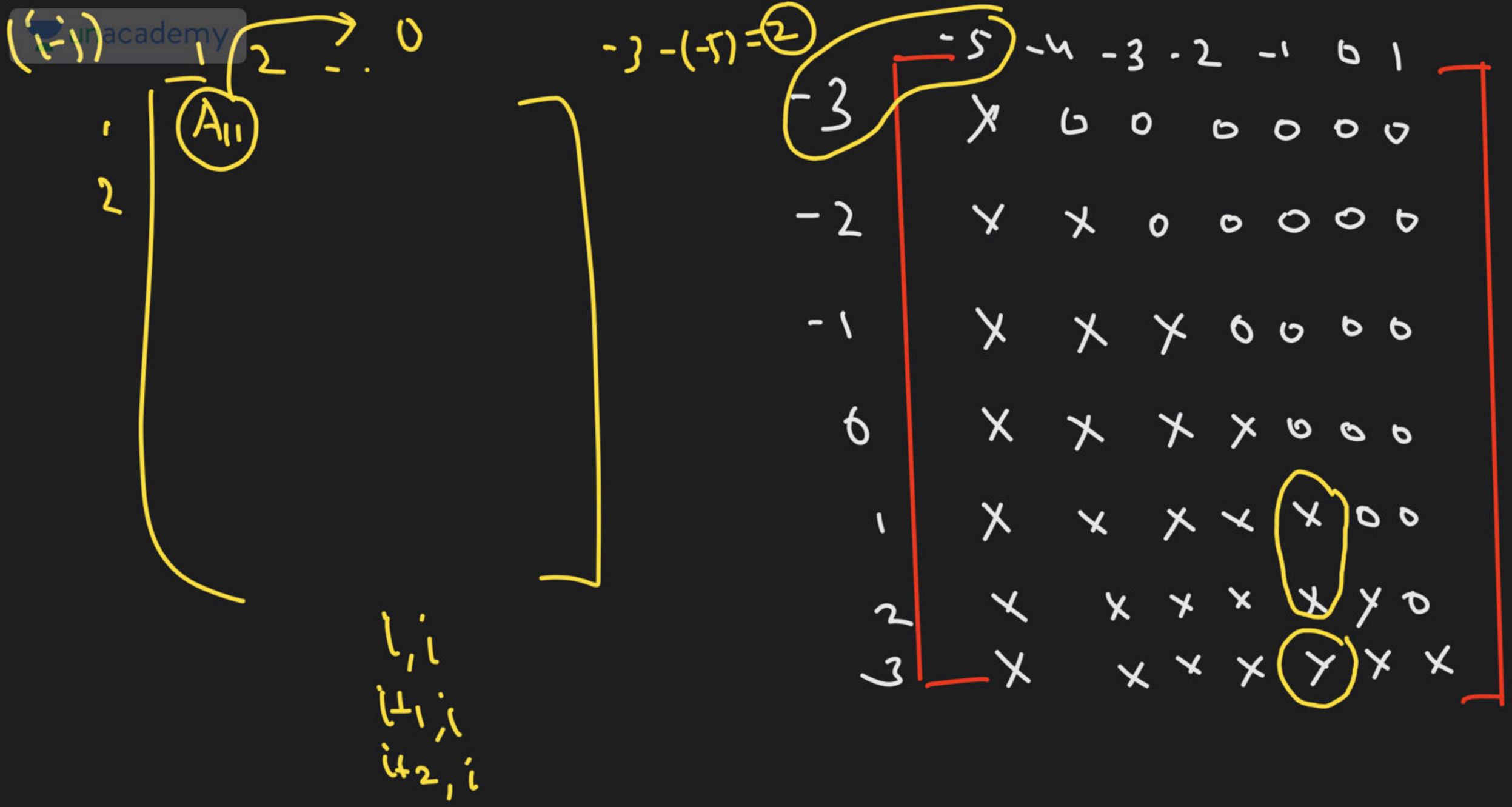
= -5 to -2

= -2 - (-5) + 1

= 4 cols

7 + 6 + 5 + 4

= 22 element


(-1)
1
2
0
A_{11}
1
2
l, i
$l-1, i$
$i+2, i$
$-3-(-5)=2$
-5
-4
-3
-2
-1
0
1
-3
-2
-1
0
1
2
3

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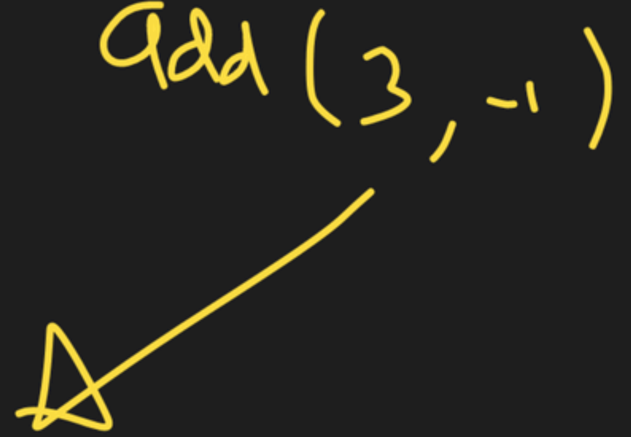


4

- 2

= 2

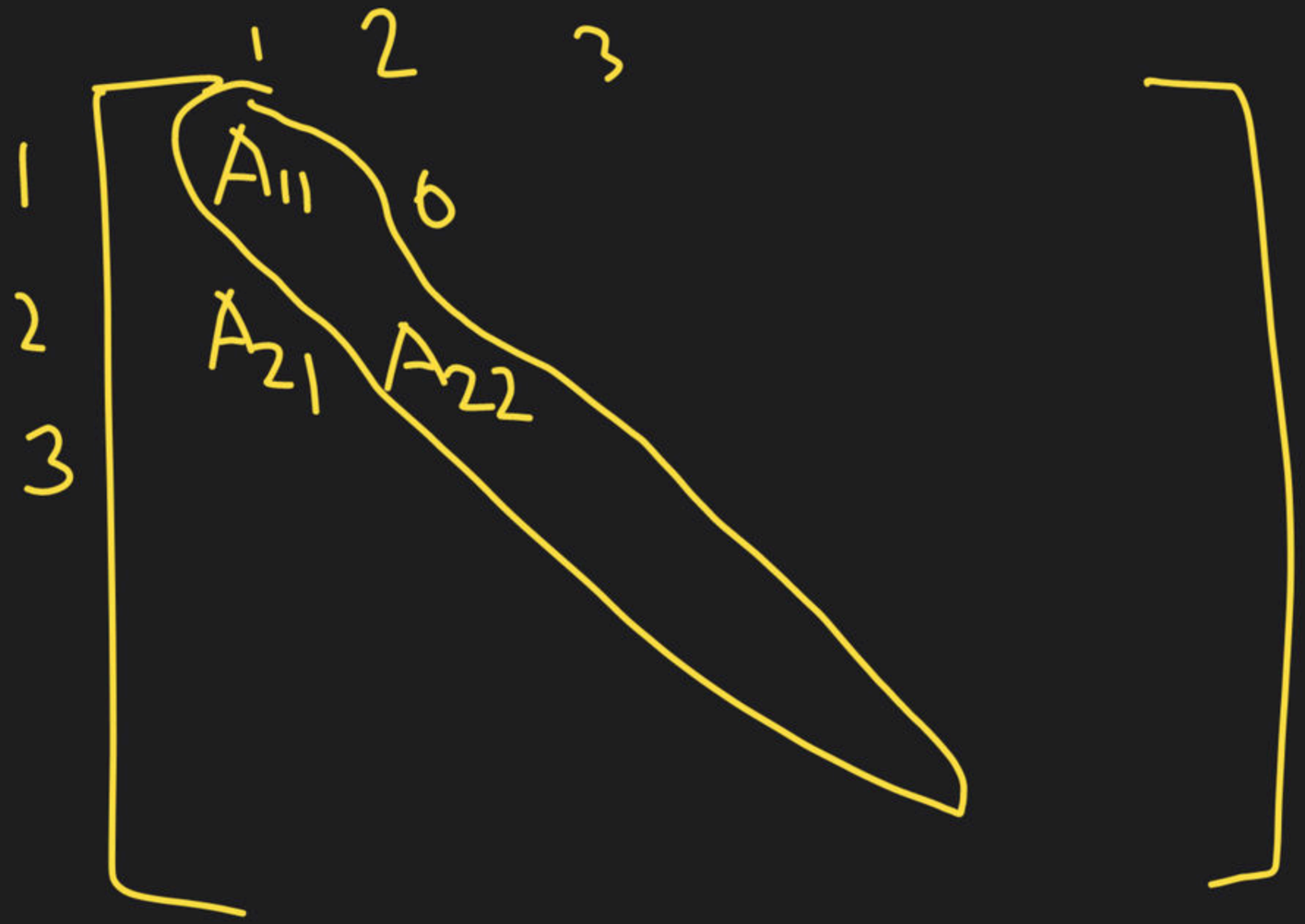
22+2

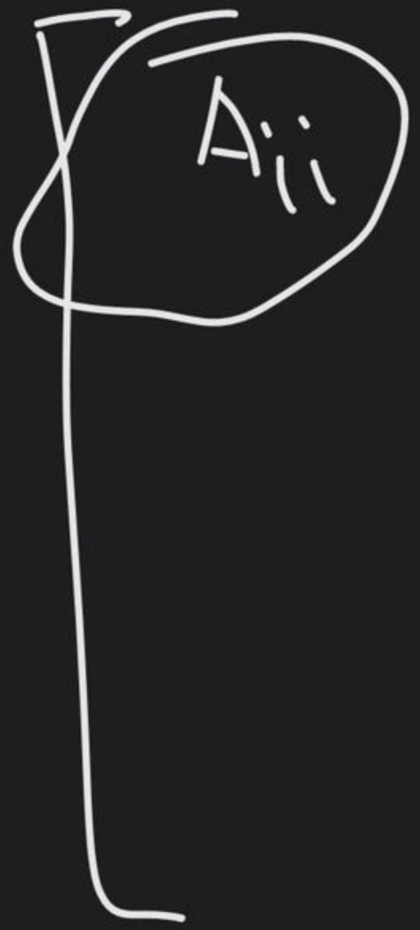
= 24 element

Memory = 24 x 2

= 48 Bytes

find ⇒ 1000+48 = 1048





$A[-300 \ldots 300]$

$[-500 \ldots 100]$

G_{ii}

$A[1..100][-10..89]$

$A[2..10][2..10]$

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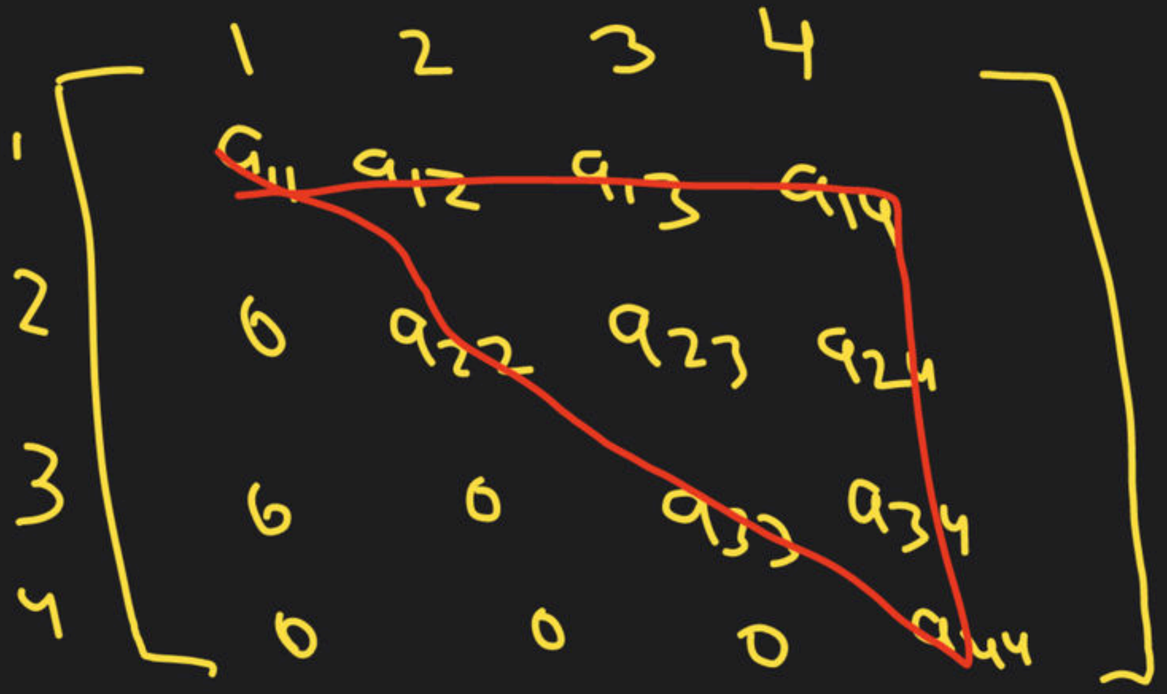
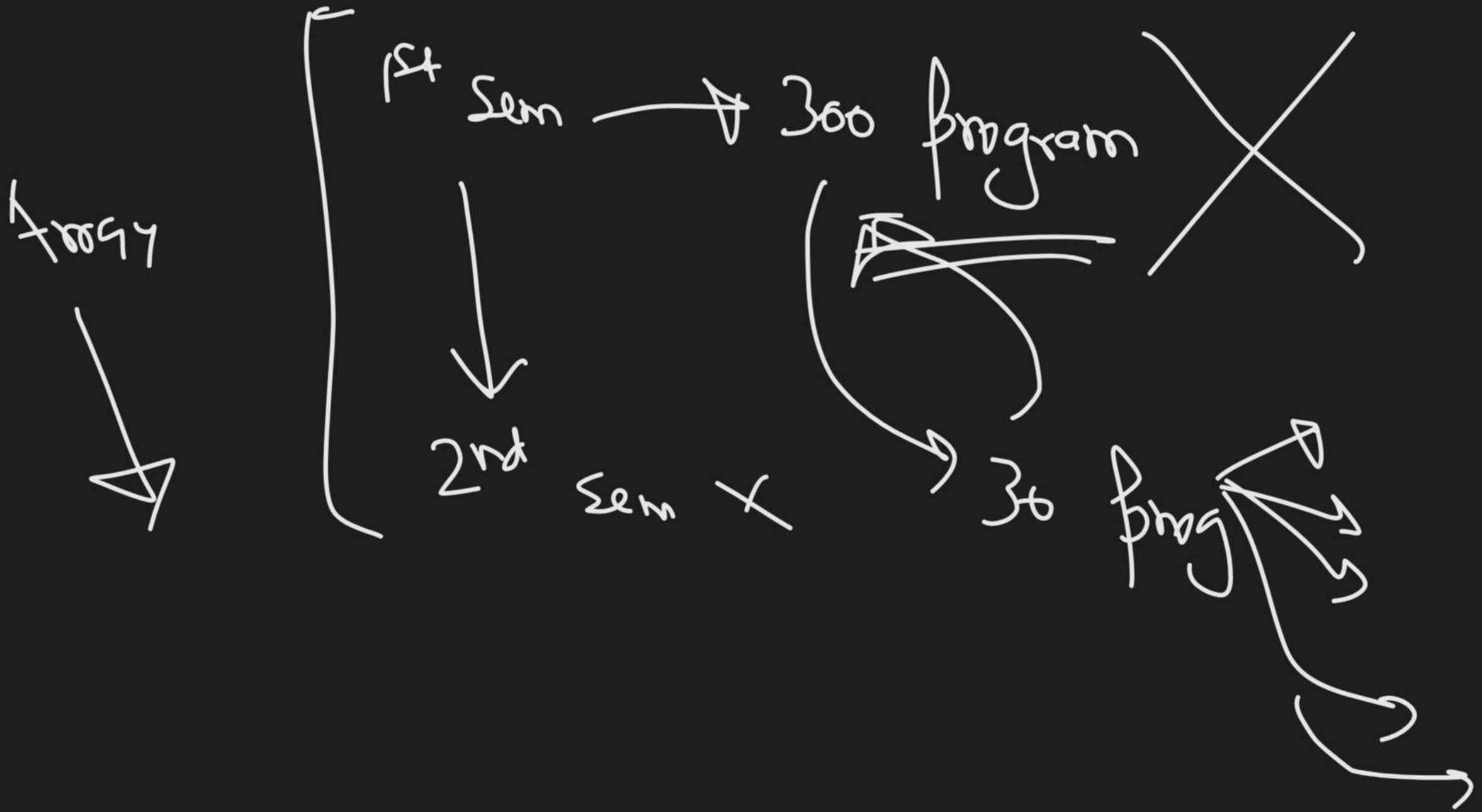
Upper triangular Matrix





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RMO

Upper Triangular Matrix

Aad(a_{34})

row1, row2

(4 + 3)

=7 element

within row index 3, ele. already filled before a_{34}

= (4-3) = 1 elem

	1	2	3	4
1	a_{11}	a_{12}	a_{13}	a_{14}
2	0	a_{22}	a_{23}	a_{24}
3	0	0	a_{33}	a_{34}
4	0	0	0	a_{44}

a_{11}	a_{12}	a_{13}	a_{14}	a_{22}	a_{23}	a_{24}	a_{33}	a_{34}	a_{44}

H.W

Upper Triangular Matrix RMO

add(a_{ij}) ?

formula


-5 -4 -3 -2 -1 0 1
-3
-2
-1
0
1
2
3

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THANK YOU!

Here's to a cracking journey ahead!