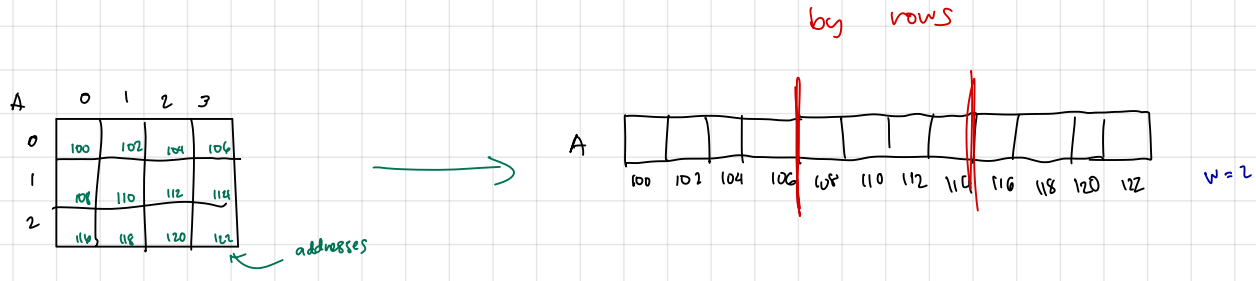
4) Row major and Column Major order

ex: int A [3][4];



find the address of Add(A [2][1])

$$add(A[i][j]) = L_0 + (i * n + j) * w$$

column

m = total rows
n = total columns

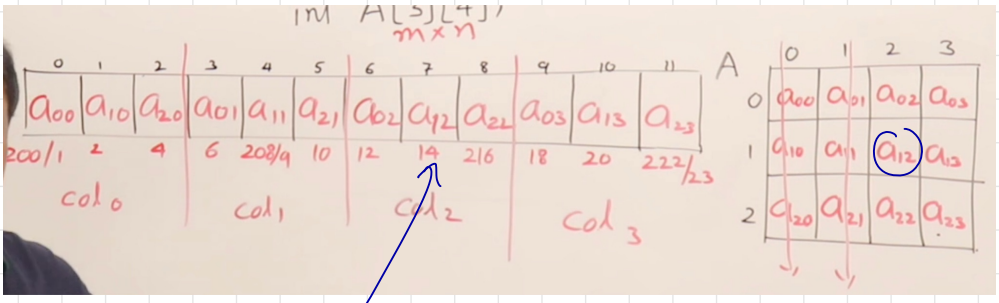
similar to this formula

$$L_0 + i * w$$

$$add(A[2][1]) = 100 + [2 * 4 + 1] * 2$$
$$= 100 + 9 * 2$$
$$= 100 + 18$$
$$= 118$$

5) Column major formula

int A [3][4];



find Add (A[1][2]) : based from compiler formula = $L_0 + i * w$

$$add(A[i][j]) = L_0 + (j * m + i) * w$$

row swap

m = total rows
n = total columns

# of rows

Note

Row major (left to right)

$$A[i][j] = L_0 + (i * n + j) * w$$

Column major (right to left)

$$A[i][j] = L_0 + (j * m + i) * w$$

52 Formula for n dimension Array

- Row major (→)

int A[d1][d2][d3][d4];

find Add(A[i1][i2][i3][i4]) = L0 + (i1 * d2 * d3 * d4 + i2 * d3 * d4 + i3 * d4 + i4) * w

Kaya ganito ang formula

A[d1][d2]

add(A[i][j]) = L0 + (i * d2 + j) * w

Column major (←)

int A[d1][d2][d3][d4];

find Add(A[i1][i2][i3][i4]) = L0 + (i4 d3 d2 d1 + i3 d2 d1 + i2 d1 + i1) * w

---

General formula

Row major

$$Add(A[i_1][i_2]\ldots[i_p]) = L_0 + \left(\sum_{p=1}^{n} i_p * \prod_{q=q+1}^{n} d\right) w$$

Time complexity

if	how many multiplications
n = 4	3
n = 5	4
⋮	

$= n-1 + n-2 + \ldots + 3 + 2 + 1 = \frac{n(n-1)}{2}$

$\hookrightarrow O(n^2)$