



# Pertemuan - 4

## Matriks Jarang dan Pengalamatan Matriks

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# PENGALAMATAN

**Array / Larik**

$$\text{LOK(LA[K])} = \text{Awal(LA)} + W(K - \text{LB})$$

Contoh:

Misalkan Awal (JUAL) = 100 dan  $W=4$ , maka

$$\text{LOK (JUAL[1990])} = 100$$

$$\text{LOK (JUAL[1991])} = 104$$

$$\text{LOK (JUAL[1992])} = 108$$

Berapa lokasi JUAL[2000] ? untuk mendapat lokasi tersebut

$$\begin{aligned}\text{LOK(LA[K])} &= \text{Awal(LA)} + W(K - \text{LB}) \\ &= 100 + 4 * (2000 - 1990) \\ &= 140\end{aligned}$$



# PENGALAMATAN

## Array / Larik

Lokasi Memori

**Awal - 100**  
**104**  
**108**  
**112**  
**116**  
**112**  
**124**  
**128**  
**132**  
**136**  
**140**


Array

Jual(1990)  
Jual(1991)  
Jual(1992)  
Jual(1993)  
Jual(1994)  
Jual(1995)  
Jual(1996)  
Jual(1997)  
Jual(1998)  
Jual(1999)  
Jual(2000)



## Struktur Data : **Matriks**

### Definisi

- struktur data yang mengacu pada sekumpulan elemen yang diakses melalui indeks
- Array dua dimensi, yang memiliki indeks baris dan kolom

**Array B dua dimensi (matriks) :**

**- jumlah baris 2, kolom 3**

**- data 18, 03, 69, 24, 08, 70.**

	1	2	3
1	18	03	69
2	24	08	70

# Proses Matriks

1. Elemen Matriks diproses Baris demi Baris
2. Elemen Matriks diproses Baris demi Baris

**Array B dua dimensi (matriks) :**  
- jumlah baris 2, kolom 3  
- data 18, 03, 69, 24, 08, 70.

	1	2	3
1	18	03	69
2	24	08	70

# PROSES MATRIKS

## Matriks

**Array B dua dimensi (matriks) :**

- jumlah baris 2, kolom 3
- data 18, 03, 69, 24, 08, 70.

	1	2	3
1	18	3	69
2	24	8	70

# PROSES MATRIKS

## Matriks

**Array B dua dimensi (matriks) :**

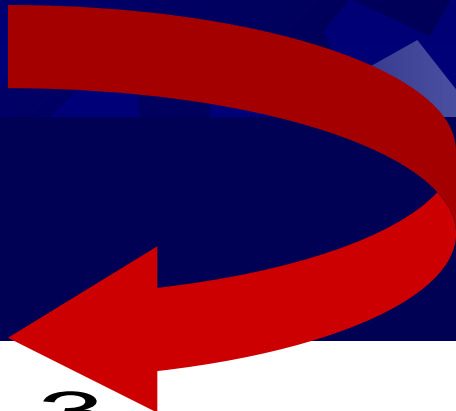
- jumlah baris 2, kolom 3
- data 18, 03, 69, 24, 08, 70.

	1	2	3
1	18	3	69
2	24	8	70

# INISIALISASI

## Matriks

```
For Baris = 1 to 2 do  
  For Kolom = 1 to 3 do  
    A(Baris, Kolom) = 0  
  Endfor  
Endfor
```



	1	2	3
1	0	0	0
2	0	0	0



Isi dengan 1,2,3,4,5,6

**Matriks**

*Indeks = 1*

For Baris = 1 to 2 do

For Kolom = 1 to 3 do

*A(Baris, Kolom) = Indeks*

*Indeks = Indeks + 1*

Endfor

Endfor

	1	2	3
1	1	2	3
2	4	5	6

Isi dengan 1,3,5,7,9,11

**Matriks**

Indeks = ???

For Baris = 1 to 2 do

For Kolom = 1 to 3 do

*A(Baris, Kolom) = ???*

Indeks = ???

Endfor

Endfor

	1	2	3
1	1	3	5
2	7	9	13

# Menjumlahkan setiap baris

## Matriks

```
For Baris = 1 to 2 do
```

```
  TotalBaris = 0
```

```
  For Kolom = 1 to 3 do
```

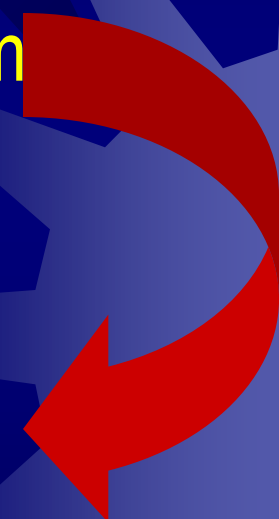
```
    TotalBaris = TotalBaris + A[Baris,Kolom]
```

```
  Endfor
```

```
  Print Total Baris
```

```
Endfor
```

	1	2	3	
1	18	3	69	90
2	24	8	70	102



# Menjumlahkan $C = A + B$

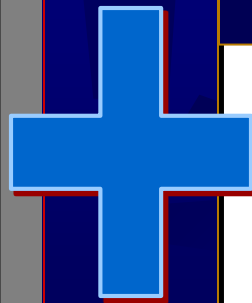
**Dua buah Matriks**

```
For Baris = 1 to 2 do  
  For Kolom = 1 to 3 do
```

**$C[\text{Baris}, \text{Kolom}] = A[\text{Baris}, \text{Kolom}] + B[\text{Baris}, \text{Kolom}]$**

```
Endfor  
Endfor
```

	1	2	3
1	18	3	69
	24	8	70



	1	2	3
1	1	2	3
2	4	5	6

# Mengalikan

## Matriks

```
For Baris = 1 to 2 do
```

```
For Kolom = 1 to 3 do
```

```
C[Baris, Kolom] = 0
```

```
For K = 1 to P do
```

```
    C[Baris, Kolom] = C[Baris, Kolom] + A[Baris, K] + B[K, Kolom]
```

```
Endfor
```

```
Endfor
```

```
Endfor
```

	1	2	3
1	18	3	69
2	24	8	70

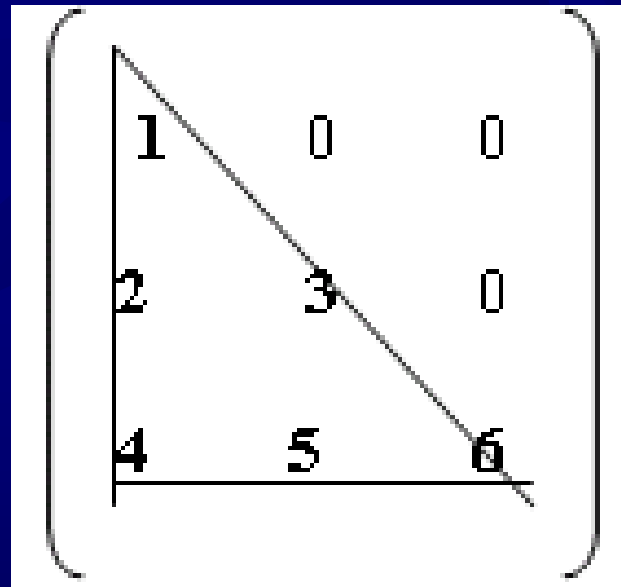
Kita lanjutkan  
untuk yang satu ini .....



# Matriks Jarang

Sparse Matrix

matriks yang elemennya banyak bernilai 0 (nol).



A 3x3 matrix diagram enclosed in rounded corners. A diagonal line runs from the top-left to the bottom-right. The numbers 1, 2, 3, 4, 5, and 6 are placed along this diagonal. The number 1 is at the top-left, 2 is below it, 3 is to the right of 2, 4 is below 3, 5 is to the right of 4, and 6 is at the bottom-right. The cells above the diagonal (top-right and middle-right) contain the number 0. The cell below the diagonal (middle-left) is empty.

1	0	0
2	3	0
4	5	6

Idenya : bgm mengkonversinya supaya lebih hemat memori

# Contoh Matriks Jarang

Sparse Matrix

1	0	0
2	3	0
4	5	6

Matriks Segitiga

1	2	0	0
3	4	5	0
0	6	7	8
0	0	9	10

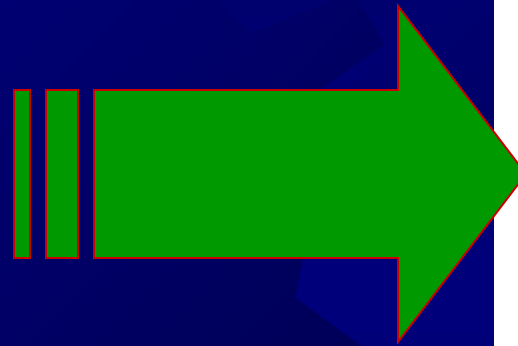
Matriks  
Tridiagonal



# Konversi Matriks Jarang

Sparse Matrix

1	0	0
2	3	0
4	5	6

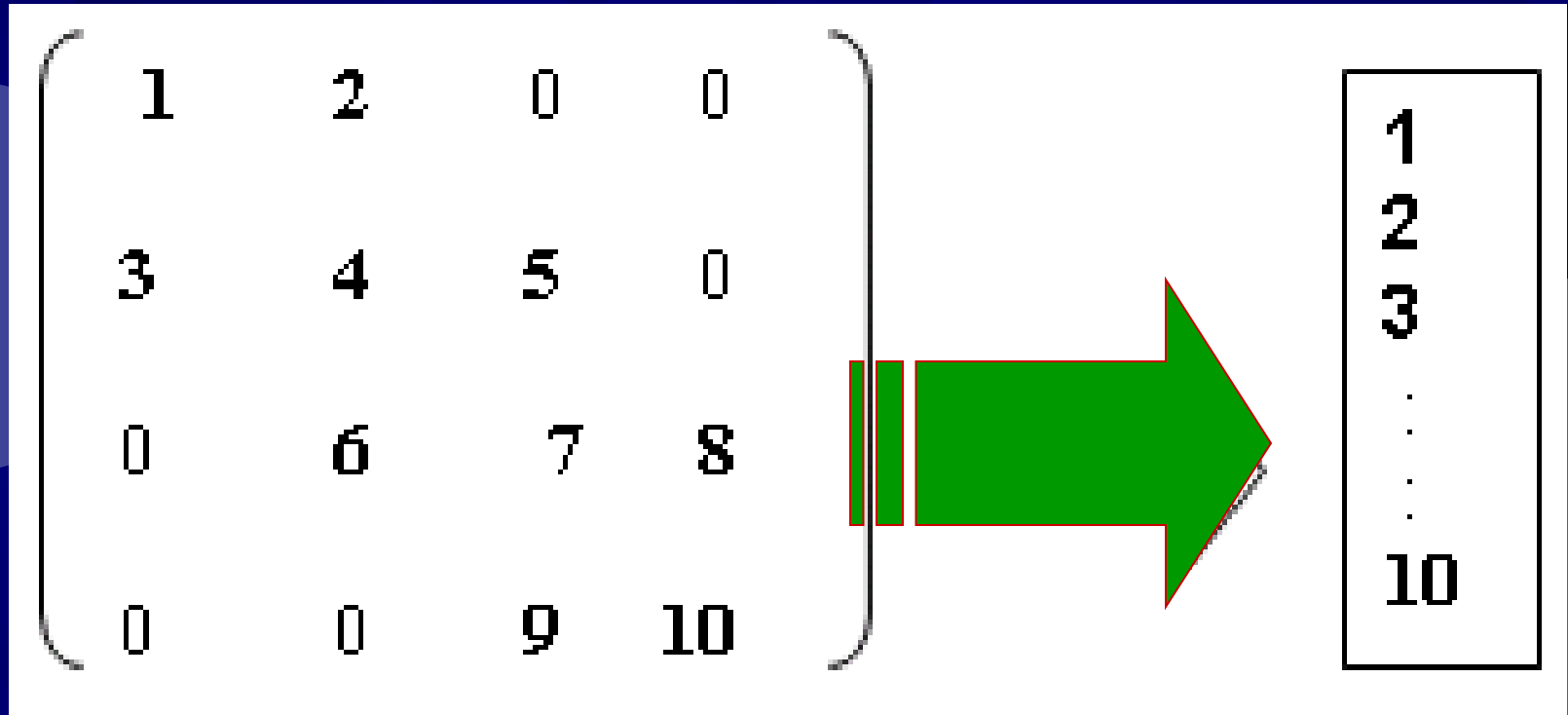


1
2
3
4
5
6

9 data menjadi 6 data

# Konversi Matriks Jarang

## Sparse Matrix



16 data menjadi 10 data

# Ubah Matriks Segitiga jadi Array

## Sparse Matrix

Program Ubah\_Matrik\_Segitiga\_jadi\_Array

### KAMUS

Baris, Kolom : integer

A : array [1..3, 1..3] of integer

S : array [1..6] of integer

### ALGORITMA

$JLH \leftarrow 0$

For Baris  $\leftarrow 1$  to 3 do

For Kolom  $\leftarrow 1$  to Baris do

$JLH \leftarrow JLH + 1$

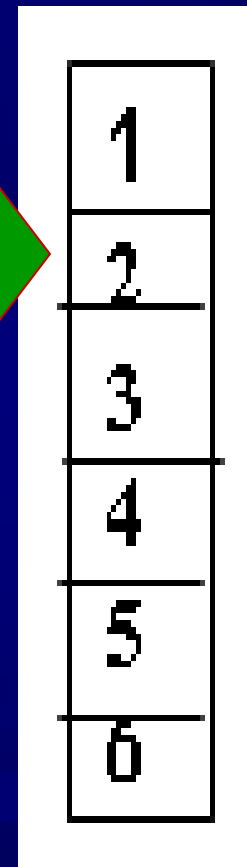
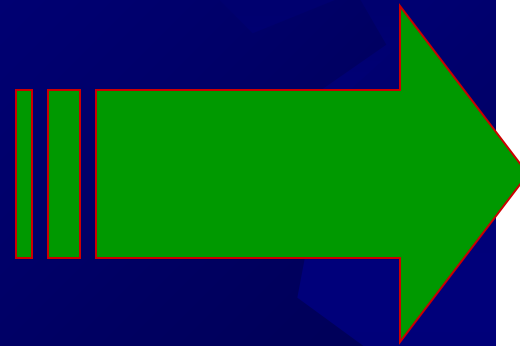
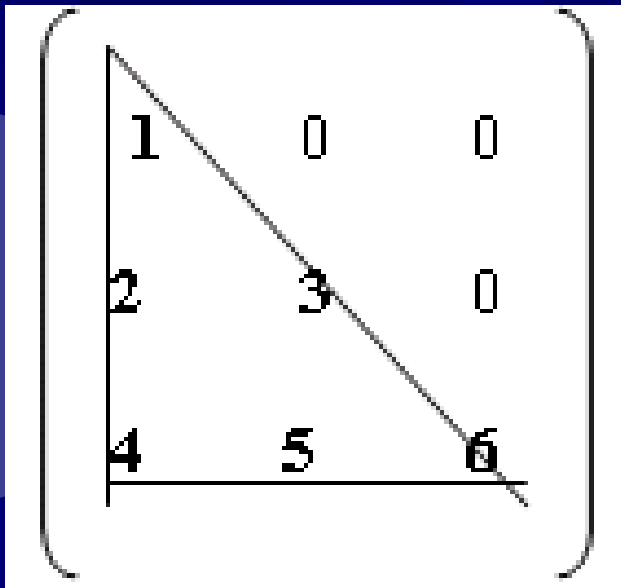
$S[JLH] \leftarrow A[Baris, Kolom]$

Endfor

Endfor

# Lokasi Elemen Matriks Segitiga

Sparse Matrix



Lokasi pada array :

$$L = \text{Baris} (\text{Baris} - 1)$$

+ Kolom

# Pengalamatan Matriks

## Ordering

$A[1,1], A[1,2], A[1,3], A[2,1], A[2,2], A[2,3]$ ..... jika row major

$A[1,1], A[2,1], A[1,2], A[2,2], A[1,3], A[2,3]$ ..... jika column major

	1	2	3
1	$A[1,1]$	$A[1,2]$	$A[1,3]$
2	$A[2,1]$	$A[2,2]$	$A[2,3]$

# Pengalamatan Matriks

## Row Ordering

$A[1,1], A[1,2], A[1,3], A[2,1], A[2,2], A[2,3]$ ..... jika row major

$A[1,1], A[2,1], A[1,2], A[2,2], A[2,2], A[2,3]$ ..... jika column major

$X[1,1]$	Baris ke -1
$X[1,2]$	Baris ke -1
$X[1,3]$	Baris ke -1
$X[2,1]$	Baris ke-2
$X[2,2]$	Baris ke-2
$X[2,3]$	Baris ke-2

# Pengalamatan Matriks

## Column Ordering

$A[1,1], A[1,2], A[1,3], A[2,1], A[2,2], A[2,3]$ ..... jika row major

$A[1,1], A[2,1], A[1,2], A[2,2], A[2,2], A[2,3]$ ..... jika column major

$X[1,1]$	Kolom ke -1
$X[2,1]$	Kolom ke -1
$X[1,2]$	Kolom ke -2
$X[2,2]$	Kolom ke -2
$X[1,3]$	Kolom ke -3
$X[2,3]$	Kolom ke -3

# Cari Alamat Elemen Matriks

## Row Ordering

	1	2	3	4	5	6
1	400	404	408	412	416	420
2	424	428	...			
3	448				???	
4	...		???			
5						
6						
7						
8						???



# Pengalamatan Matriks

## Ordering

### Mencari lokasi memori pada Row-major order

$$\text{Lokasi } (A[B,K]) = \text{Base}(A) + w [ N ( B-1) + (K-1) ]$$

### Mencari lokasi memori pada Column-major order

$$\text{Lokasi } (A[B,K]) = \text{Base}(A) + w [ M ( B-1) + (K-1) ]$$

Base (a): lokasi awal di memori (alamat  $A[1,1]$ )

W: jumlah word/byte utk menyimpan 1 elemen

M: jumlah baris pada matriks A

N: jumlah kolom pada matriks A

# Cari Alamat Elemen Matriks

## Column Ordering

	1	2	3	4	5	6
1	400	404	408	412	416	420
2	432	436	440	444	448	452
3	464				???	
4	496		???			
5						
6						
7						
8						???