

1 2 3 4 5

$$\text{sum}(L, R) = \text{arr}[L], \text{arr}[L+1], \dots, \text{arr}[R]$$

$Q_1 \text{ sum}(1, 3) = 1 + 2 + 3 \rightarrow \text{for loop } 1 \dots R$

$Q_2 \text{ sum}(4, 4) = 1 + 2 + 3 + 4$

= 6

$\text{sum}(\text{arr}[1] \rightarrow \text{arr}[4])$   
 $O[R]$

= 10

$Q_3 \text{ sum}(1, 5) = 1 + 2 + 3 + 4 + 5$

= 15

Q queries, Per Query :  $O[R]$

Total kompl :  $O(QR)$

$$1 \leq Q \leq 10^3 \quad - \quad 1 \leq R \leq 10^7 \rightarrow \begin{cases} O(10^{10}) \\ 10^{-6} > 10^8 \\ > 1 \text{ dek} \end{cases}$$

1 2 3 4 5

---

$$Q_1: \text{sum}(1, 3) = 6$$

$$\underline{1 \quad 2 \quad 3} + \textcircled{4} = 5$$

$$Q_2: \text{sum}(1, \underline{4}) = \text{sum}(1, 3) + \text{arr}(4)$$

1 2 3 4 5

$$Q_3: \text{sum}(1, 5) = \text{sum}(1, 4) + \text{arr}[5]$$

- \* Pref sum
- \*  $\text{sum}(1, R) = \frac{\text{sum}(1, R-1) + \text{arr}[R]}{\text{Memo}[j] \rightarrow O(N)}$   
 $N$ -way array
- \*  $\text{sum}(l, R) =$

1 2 3 4 5

$$\text{sum}(1, 5) = 1 + 2 + 3 + 4 + 5$$

$$\text{sum}(3, 5) = 3 + 4 + 5$$

$$\text{sum}(1, 3) = 1 + 2 + 3$$

$$\text{sum}(3, 5) = 3 + 4 + 5$$

$$\cancel{1 + 2 + 3 + 4 + 5} = \text{sum}(1, 5)$$

$$\text{sum}(3, 5) = \text{sum}(1, 5) - \text{sum}(1, 2)$$

$$\text{sum}(L, R) = \text{sum}(1, R) - \text{sum}(1, L-1)$$

$$\text{sum}(1, N) = \text{pref}[N-1] + \text{arr}[N]$$

$$\text{sum}(1, R) = \text{pref}[R-1] + \text{arr}[R]$$

$$\text{sum}(1, L-1) = \text{pref}[L-2] + \text{arr}[L-1]$$

$$\begin{aligned} \text{sum}(L, R) &= \text{pref}[R-1] + \text{arr}[R] + \\ &\quad \text{pref}[L-2] + \text{arr}[L-1] \end{aligned}$$

\* Pre compute

$$\text{sum}(L, R) = \text{pref}[R] - \text{pref}[L-1]$$

$\psi = q \rightarrow$  ✓ abba → substring  $\text{Pa} : a, b, (3)$   
acdb → substring = abba, a, c, d, b (4)  
aaca → a, aa, aaa, aaaa → (4)

$n = 1 \rightarrow \text{min-subst Pa} = 1, S = a \text{ character}$   
 $n = 2 \rightarrow \underline{x} \underline{y} \quad \begin{cases} x = y \\ x \neq y \end{cases} \quad \begin{cases} aa \rightarrow a, aa \\ bb \rightarrow b, bb \end{cases} (2)$

$n = 3 \rightarrow \underline{x} \underline{y} \underline{z} \quad \begin{cases} \text{min -S=2} \\ x \neq y \\ x = y = z \dots \end{cases} \quad \begin{cases} ab \rightarrow a, b \\ bc \rightarrow b, c \end{cases} (2)$

$xxx \rightarrow \text{min=3 } x, xx, xxx$

$xxy \rightarrow x, y, xx \text{ min=3}$

$xyx \rightarrow x, y, xyx = 3$

$xyy \rightarrow x, y, yy = 3$

$\text{min=3}$

$x = y, x \neq z, y \neq z \quad \begin{cases} xx \\ xyz \end{cases}$   
 $x = z, y \neq x, y \neq z \quad \begin{cases} xyy \\ yzx \end{cases}$

$$N=4 \rightarrow \underline{x} \underline{y} \underline{z} \underline{x} \text{ (minimal)} \checkmark$$

$$\begin{array}{ccccccc} & & x, y, z & & (3) \\ \cancel{\underline{x}} & \cancel{\underline{x}} & \cancel{\underline{y}} & \cancel{\underline{z}} & \rightarrow & x, x, y, z, x \\ & & & & (4) & \end{array}$$

$N \geq 3 +$  bikin sama sekali tidak  
mengantongi substring random  
yg panjangnya  $> 1$

$N=3$

$\underline{x} \underline{y} \underline{z}$

$\underline{x} \underline{y} \underline{z} \underline{x} \underline{y} \underline{z} \underline{x} \underline{y} \underline{z} \dots \underline{y}$

sepanjang  $N$

~~aa, bb, cc, dd~~  $\rightarrow$  ~~dd, d, dd, dd~~

3 karakter  $dd$  zigzag

$N=1$        $x$        $\dots$

$N=2$        $x y$

$N=3$        $x y z$

$N=4$        $x y z x$

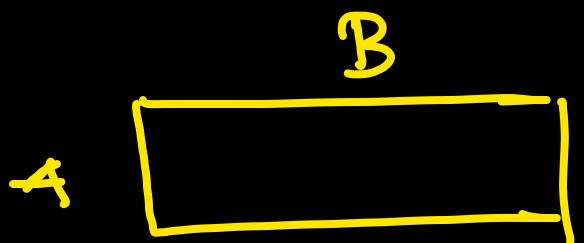
$N=5$        $x y z x y$        $\dots$

$x = 3$

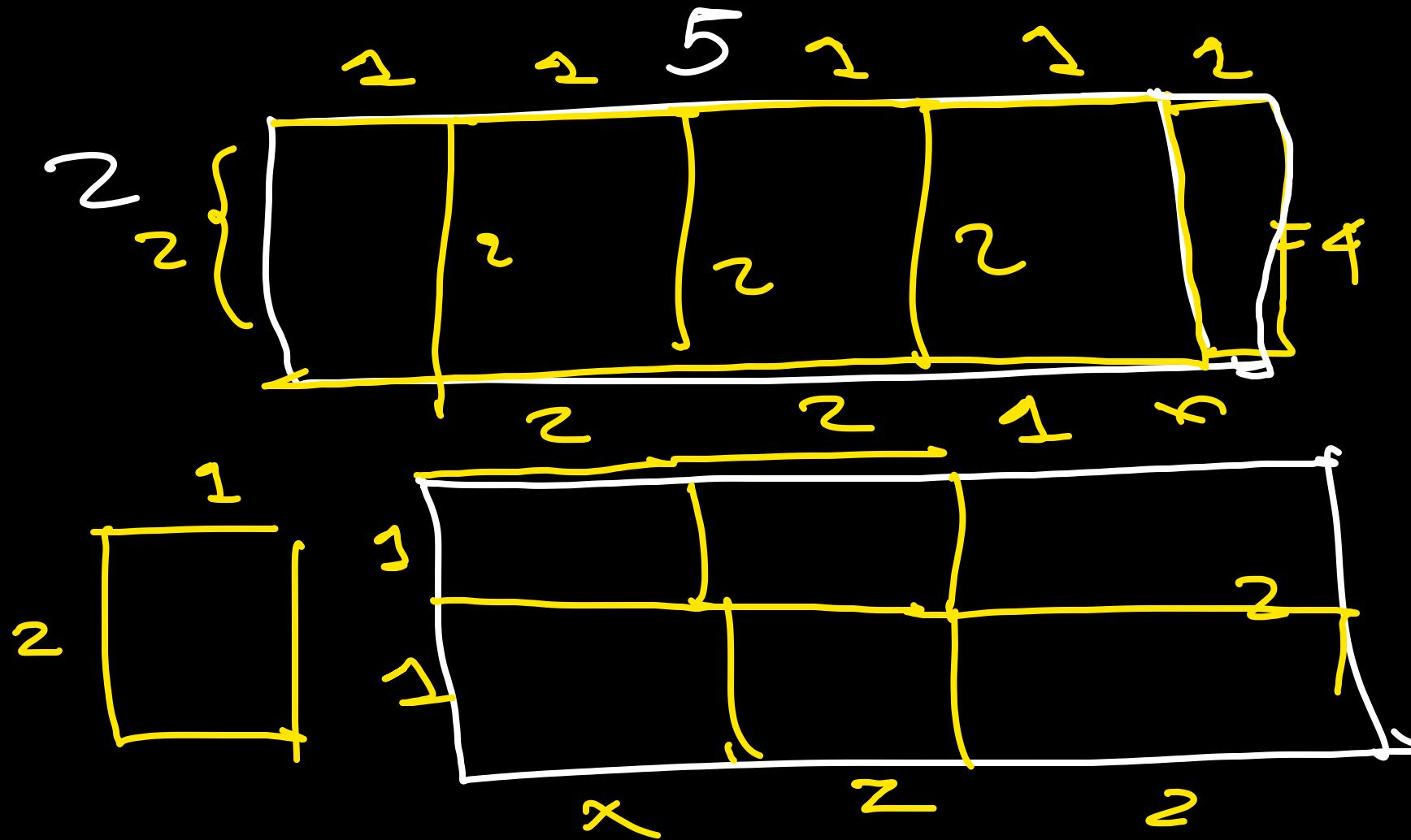
$A_3, B_3$

$$\begin{array}{ccccccc} A: & 1 & 2 & \downarrow 3 & 9 & 5 \\ B: & 5 & 2 & 3 & 1 & 9 \end{array}$$

$$\begin{array}{r} A: 1 \ 2 \ 3 \ 9 \ \underline{5} \\ \hline B: 5 \ 2 \ 3 \ 1 \ 9 \\ \hline \end{array}$$



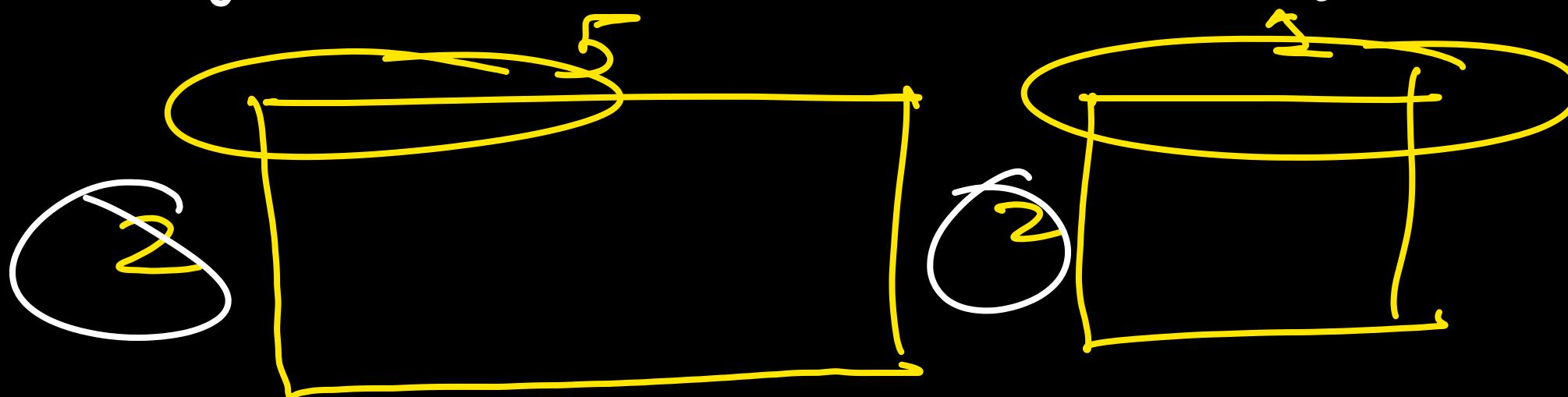
berapa banyak  
ukir max  
bisa menempati



Max ( banyak ubin  $\square$ , banyak ubin  $\square$  )

banyak ubin  $\square$  = ... ?

banyak ubin  $\square$  = ... ?



Taru / Pasang  $A \times B$  di  $N \times M$

$$A = N \rightarrow \max \left( \left\lfloor \frac{M}{B} \right\rfloor, \left\lfloor \frac{N}{A} \right\rfloor \right)$$

Array ukuran N

$$[0, 0, 0, \dots, 0]$$

Arr;  $x = y$  ( $0 \leq i \leq x$ )

$1 \times y \rightarrow x$  elemen tertama dari array  
increasing increment y

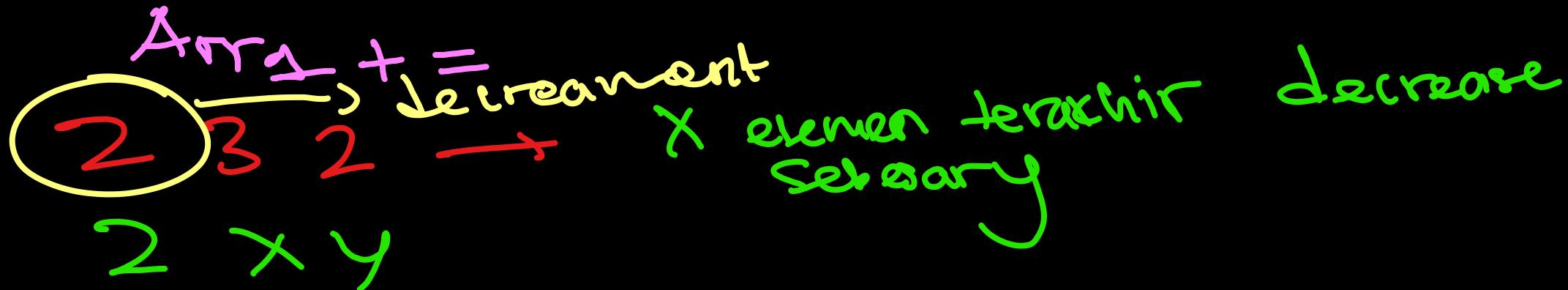
$$1 \rightarrow 3 \underset{=}{5} \rightarrow$$

$$[5, 5, 5, \dots, 0]$$

$$\rightarrow [5, 5, 5, \dots, 0, 0, 0]$$

$\text{Arr}_0, \text{Arr}_1, \text{Arr}_2$

$$\text{Arr}_0 + 5 \rightarrow \text{Arr}_0 = 5$$



2 X Y

$$[5, 5, -5, \dots, \underline{-2}, \underline{-2}, \underline{-2}]$$

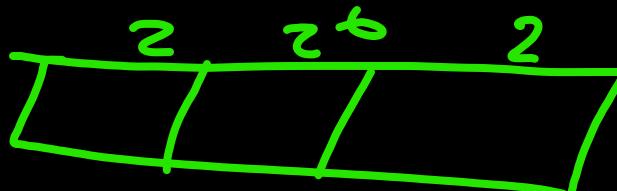
$\{ 0, 0, 0, 0, 0, 0 \}$

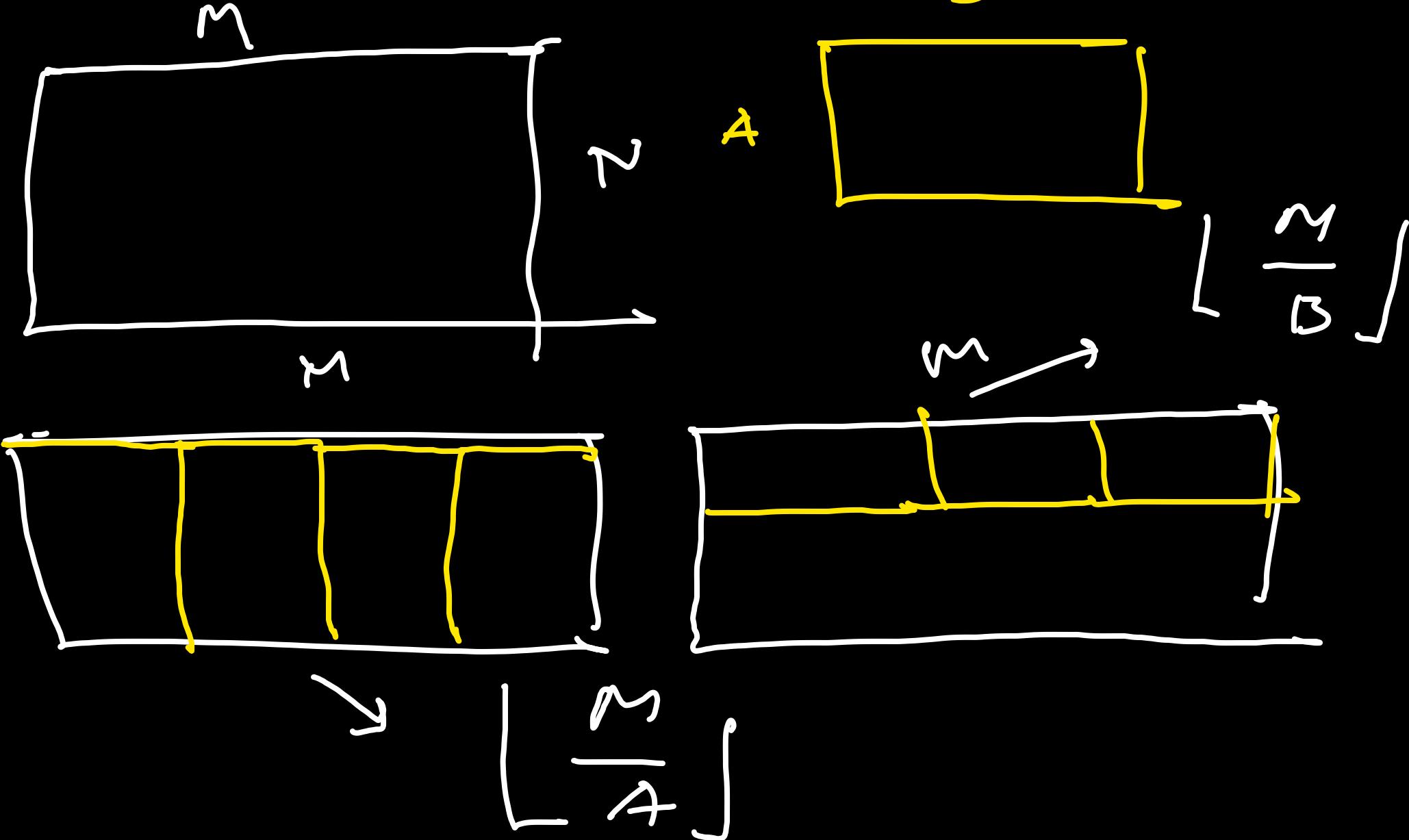
$$\begin{array}{r} 1 \quad 2 \quad 3 \\ 2 \quad 3 \quad 5 \\ 1 \quad 4 \quad 1 \end{array} + 3 - 5 + 1 \quad \left. \begin{array}{l} \{ \quad \} \\ \{ \quad \} \end{array} \right\} - 1$$

$$\begin{array}{ccccccc} 1 & 2 & & & 0 & -1 & = -1 \\ 1 & 2 & 3 & 4 & 5 & 6 & \\ & & & \text{←} & & & \end{array}$$

$[0, 0, 0, 0, 0, 0]$

- ~~$\times$~~  elemen pertama  $\rightarrow$  sudah pasti  $A[0] = a$
- ~~$\times$~~  minimal = 1  $\rightarrow$  sudah pasti
- ~~$\times$~~  elemen terakhir  $\rightarrow$   $A[n-1] = b$
- $a = 0, b = 0$





$n \quad m$

5 2

3 5



Max (Panjang M - Panjang n)

$$\max \left( \left\lfloor \frac{M}{4} \right\rfloor \cdot \left\lfloor \frac{m}{3} \right\rfloor \right) -$$

$$\max \left( \left\lfloor \frac{n}{4} \right\rfloor \cdot \left\lfloor \frac{N}{3} \right\rfloor \right)$$

$$\max \left( \max \left( \frac{M}{A} \times \frac{N}{B}, \frac{M}{B} \times \frac{N}{A} \right), \min \left( \frac{M}{A} \times \frac{N}{B}, \frac{M}{B} \times \frac{N}{A} \right) \right)$$

$$\sqrt{\left( \left\lfloor \frac{M}{A} \right\rfloor \times \left\lfloor \frac{N}{B} \right\rfloor \right)} < \left( \frac{M}{A} \times \frac{N}{B} \right) \quad \checkmark$$

$$\left( \frac{1}{2} \times \frac{3}{5} \right) = \left( \frac{3}{4} \right) \text{ l.o}$$

$$\left( \frac{5}{2} \times \frac{3}{2} \right) = 3$$

$$\left( \frac{5}{2} \right) \times \left( \frac{3}{2} \right) = 2 \times 1 \\ = 2$$

Beda





















