

- Quiz 2 is coming!

LIS. (last time)

Longest Common Subsequence (LCS)

Longest Common
Input : $X = [A B A A C D B]$
 $Y = [B A B A D C]$

Output: len of the LCS.

Step 1: $T[i, j]$ be the len of the LCS of $X[1 \dots i]$ and $Y[1 \dots j]$

$$1 \leq i \leq n, \\ 1 \leq j \leq n$$

Step 2:

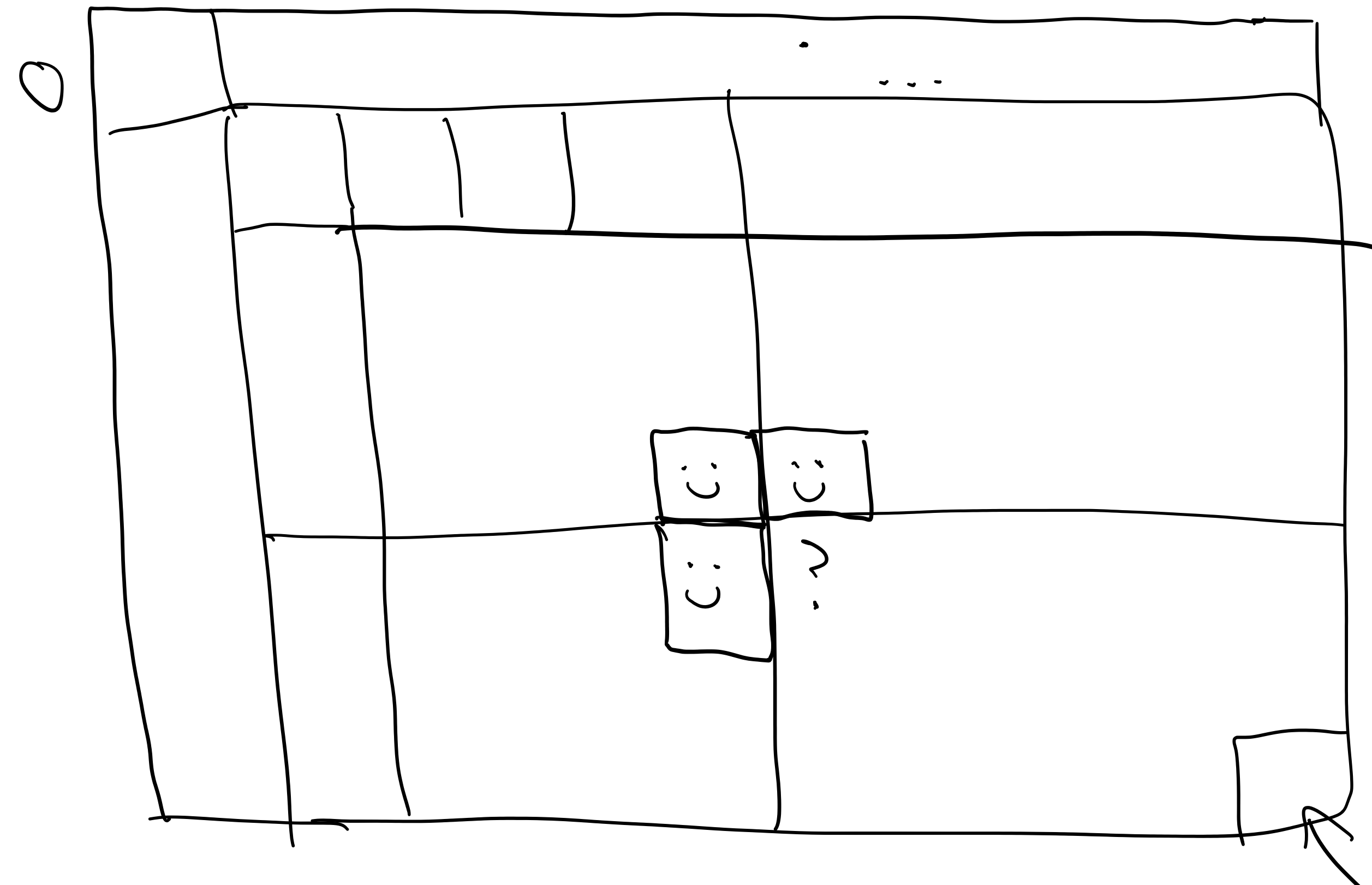
First attempt:

$$X[i] = Y[i] \quad T[i] = 1 + T[i-1]$$

$X[i] \neq Y[i]$ { use $X[i]$ but not $Y[i]$
use $Y[i]$ but not $X[i]$
use not $X[i]$; $Y[i]$

$$1 + T[i-1, j-1] \quad \text{if } X[i] = Y[j]$$

$$T[i, j] = \max \{ T[i-1, j], T[i, j-1] \} \text{ if } X[i] \neq Y[j]$$



BASE CASES:

$$I[0, j] = 0 \quad 1 \leq j \leq n$$

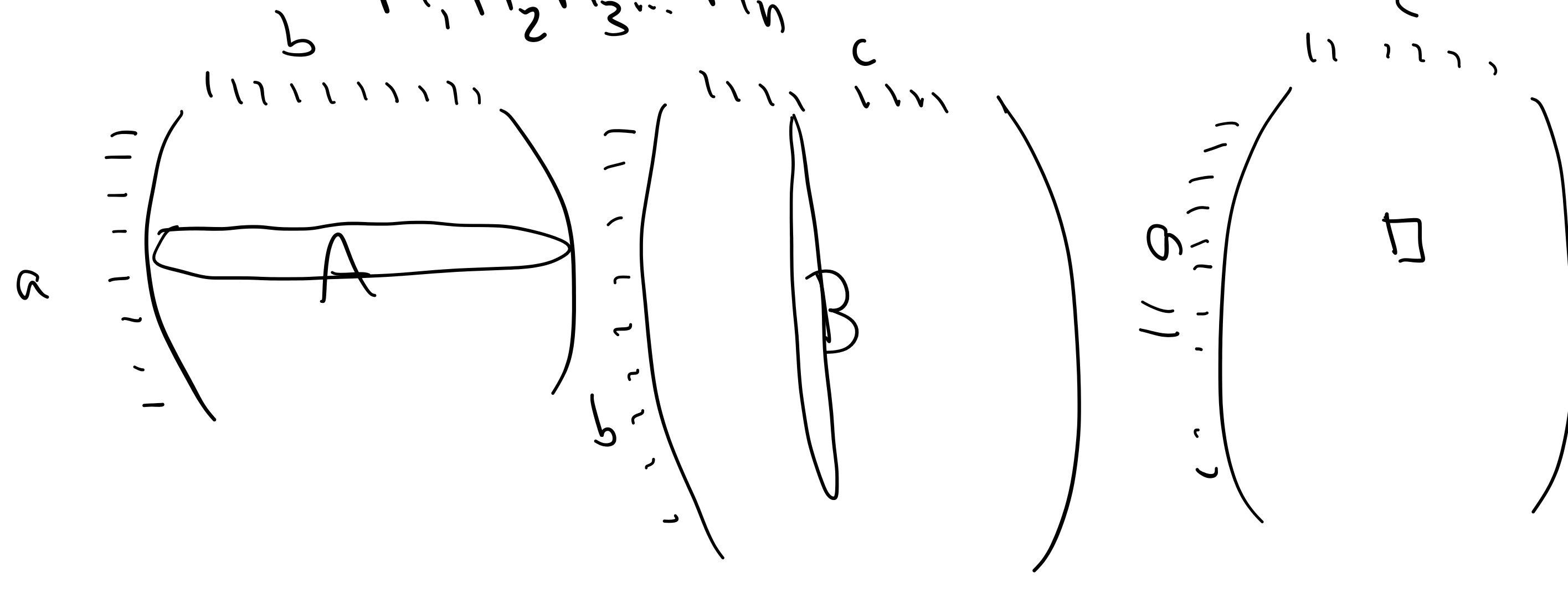
$$T[i, 0] = 0 \quad 0 \leq i \leq n$$

Runtime $O(nm)$ ABAD

Matrix Multiplication

Input: $M_1, M_2, M_3, \dots, M_n$

Output: (in big-O) fastest way to get
 $M_1 M_2 \dots M_n$



$$O(abc)$$

example

A B C D

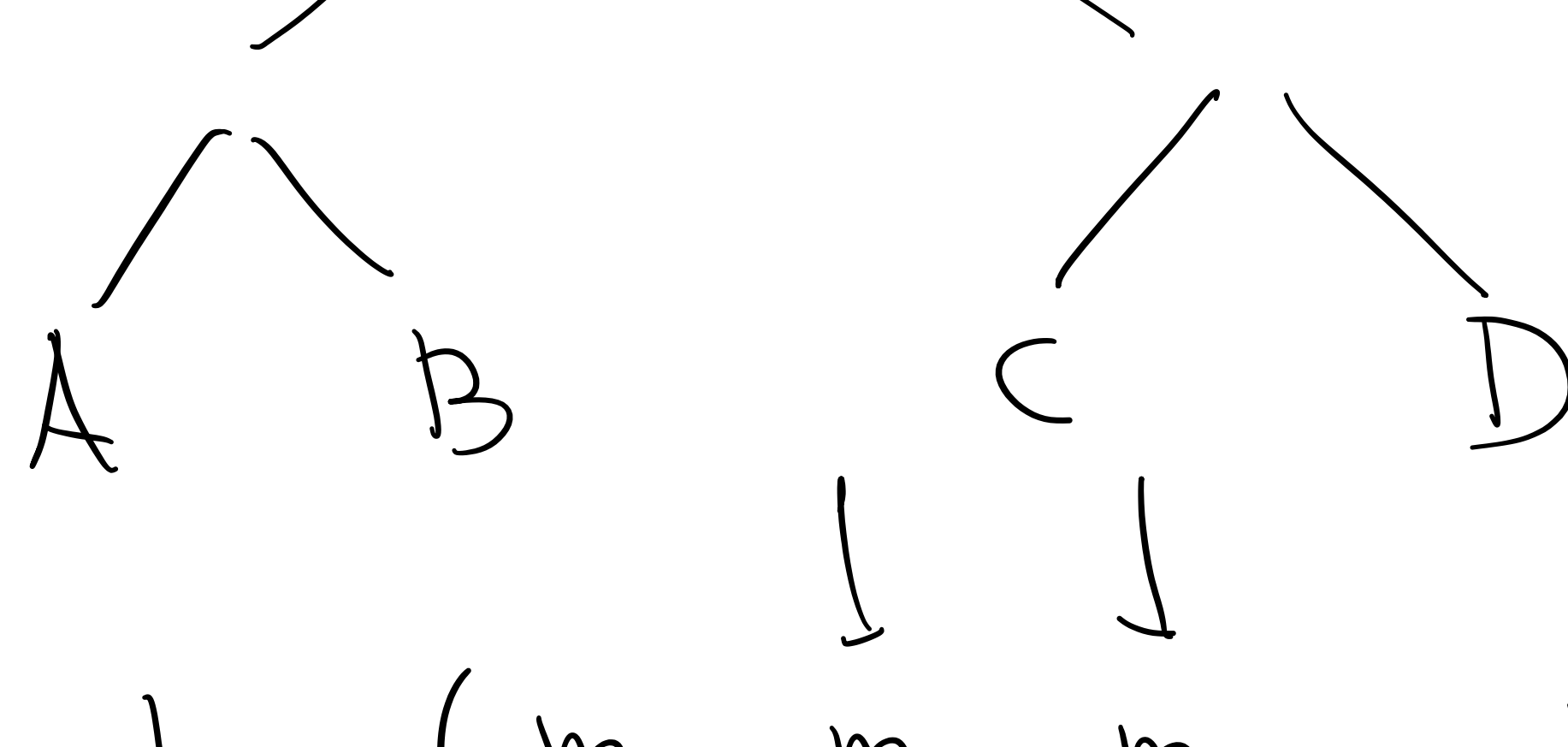
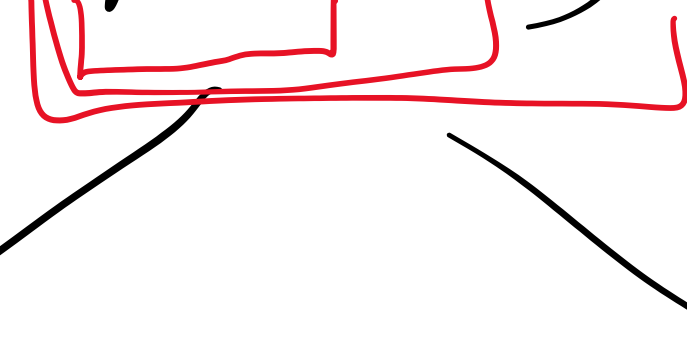
 $(3, 6) \quad (6, 10) \quad (10, 20) \quad (20, 5)$
$$(3, 6, 10, 20, 5)$$

$$\begin{pmatrix} A & B \end{pmatrix} \cdot \begin{pmatrix} C & D \end{pmatrix}$$

$(6, 20)$

Total cost = 1200 + 600 + 90 =

ABCD



Input: $(m_0, m_1, m_2, \dots, m_h)$

where M_i has rank (n_{i-1}, n_i) .

Output : min cost of product M_1, M_2, \dots, M_n .