

Matrix chain multiplication: A and B can be multiplied when number of row in B = number of column in A

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \end{bmatrix}_{2 \times 3} \quad B = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \\ b_{31} & b_{32} \end{bmatrix}_{3 \times 2}$$

$$A \times B = \begin{bmatrix} a_{11}b_{11} + a_{12}b_{21} + a_{13}b_{31} & a_{11}b_{12} + a_{12}b_{22} + a_{13}b_{32} \\ a_{21}b_{11} + a_{22}b_{21} + a_{23}b_{31} & a_{21}b_{12} + a_{22}b_{22} + a_{23}b_{32} \end{bmatrix}_{2 \times 2}$$

No. of multiplications = 12 (By observation).
 $= 2 \times 3 \times 2 = 12$. (by formulae).

$$A_1 = 2 \times 3 \quad A_2 = 3 \times 4 \quad A_3 = 4 \times 2$$

Minimum multiplication to find $A_1 A_2 A_3$.

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Minimum multiplication to find $A_1 A_2 A_3$.

$$(A_1 \cdot A_2) \cdot A_3$$

Dimensions $(A_1 \cdot A_2) \cdot A_3$
 $2 \times 4 \quad 4 \times 2$
 Cost - $2 \times 3 \times 4 = 24$
 Resulting Dimension 2×4

$$A_1 (A_2 \cdot A_3)$$

Dimensions $A_1 \cdot (A_2 \cdot A_3)$
 $2 \times 3 \quad 3 \times 2$
 Cost $3 \times 4 \times 2 = 24$
 dimension 2×3

Cost - $2 \times 3 \times 4 = 24$
 Resulting Dimension 2×4
 Cost = $2 \times 4 \times 2 = 16$
 \therefore Total cost operations = $24 + 16 = 40$

Dimension 2×3 3×2
 Cost = $2 \times 3 \times 2 = 12$
 \therefore Total cost = $24 + 12 = 36$

$c[1,3] =$
 A

$A_1 = 2 \times 3$ $A_2 = 3 \times 4$ $A_3 = 4 \times 2$
 Minimum multiplication to find $A_1 A_2 A_3$.

$$\underbrace{c[1,1]}_{A_1} = 0 \quad \left| \quad \underbrace{c[2,2]}_{A_2} = \underbrace{c[3,3]}_{A_3} = 0$$

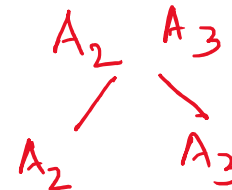
$$c[1,2] = c[1,1] + c[2,2] + 2 \times 3 \times 4$$

$$A_1 A_2 = 0 + 0 + 24 = 24$$



| | 1 | 2 | 3 |
|---|---|----|----|
| 1 | 0 | 24 | |
| 2 | | 0 | 24 |
| 3 | | | 0 |

$$c[2,3] = c[2,2] + c[3,3] + 3 \times 4 \times 2 = 24$$



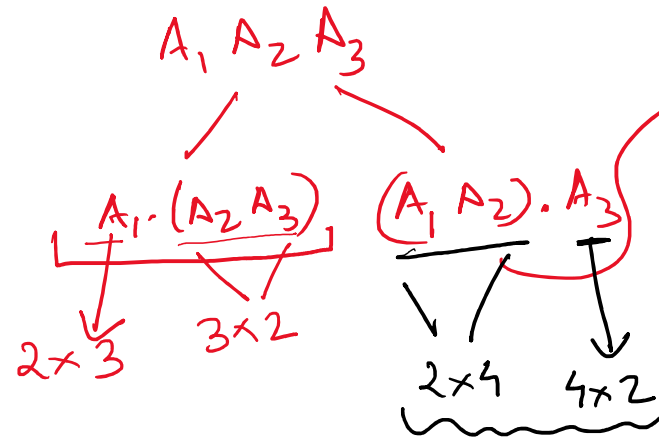
| | 1 | 2 | 3 |
|---|---|----|----|
| 1 | 0 | 24 | 36 |

$A_1 = 2 \times 3$ $A_2 = 3 \times 4$ $A_3 = 4 \times 2$
 Minimum multiplication to find $A_1 A_2 A_3$.

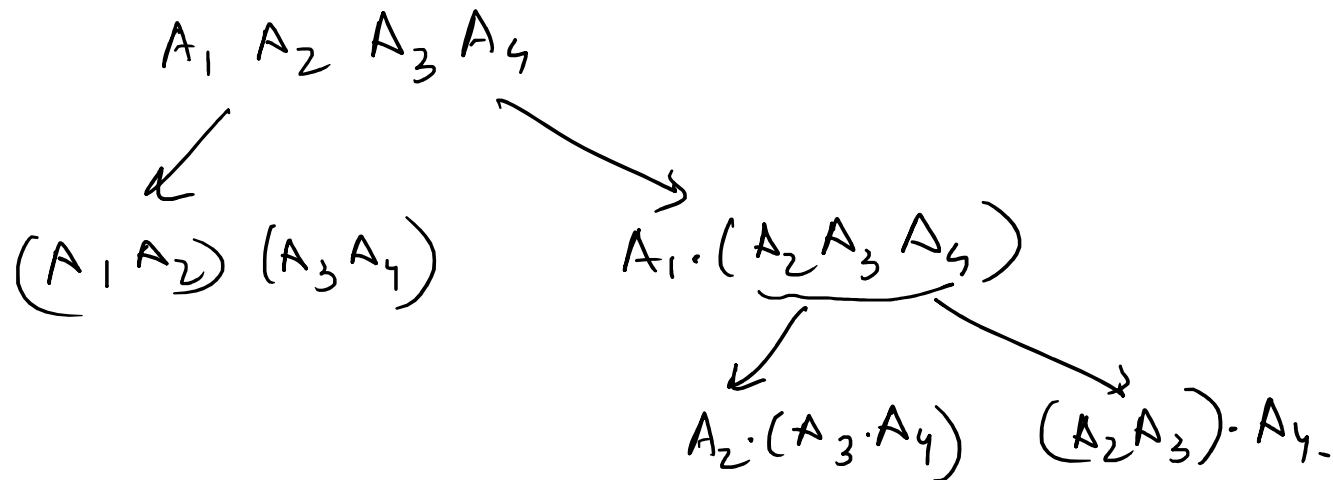
| | 1 | 2 | 3 |
|---|---|----|----|
| 1 | 0 | 24 | 36 |
| 2 | | 0 | 24 |
| 3 | | | 0 |

Minimum multiplication to find $A_1 A_2 A_3$.

$$c[1,3] = c[1,1] + c[2,3] + 2 \times 3 \times 2 = 0 + 24 + 12 = 36.$$



$$\begin{aligned}
 &= c[1,2] + c[3,3] + \\
 &\quad 2 \times 4 \times 2 \\
 &= 24 + 0 + 16 \\
 &= 40.
 \end{aligned}$$



Topic-

Short Notes-

What ?? Why ?? How ???

~~Sorting~~ Algorithm.

TC SC

Differences

Greedy & DP

DP & Divide & Conquer.

Difference between 2 sorting algos.

Prims vs Kruskal.

Dijkstra vs Floyd Warshall
vs Bellman Ford.

Prims

Kruskal.

1. vs Bellman

LCS \rightarrow \times

\Downarrow

Prepare.