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

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

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

No. of multiplications = 12 (By observation).

= 2+3+2 = 12. (by formulae).

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

Minimum multiplication to find AIAZA3.

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

Minimum multiplication to find AIA2A3.

(A1.A2) . A3

A1 (A2. A3)

Dimensions  $2\times3$   $3\times4$   $4\times2$ Cost-  $2\times3+4=24$ Resulting Dimension  $2\times4$ Cost =  $2\times4\times2=16$ 

:. Told cost operations = 24+16=40.

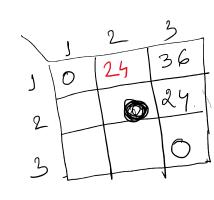
A<sub>1</sub> · (A<sub>2</sub> · A<sub>3</sub>) Dimensions  $2 \times 3$   $3 \times 4$   $4 \times 2$ Cost Dimension  $3 \times 4$   $3 \times 2$ COST = 2+3\*2=12.

: Tow ar = 24+12 = 36.

A1 = 2×3 A2 = 3×4 A3 = 4×2

Minimum multiplication to find AIA2A3.

$$C[1,1] = A_1 \quad C[2,2] = A_2$$
 $C[1,2] = A_1 A_2$ 
 $C[2,3] = A_2 A_3$ 
 $C[1,3] = A_1 A_2 A_3$ 



$$C[1/3] = A_1 A_2 A_3 - C[1/1] = A_1$$

$$A = 2 \times 3 \qquad A_2 = 3 \times 4 \qquad A_3 = 4 \times 2.$$

$$C[1/3]$$

$$A_1 A_2 A_3$$

$$C[1/2] + C[3/3] + C[1/2] + C[3/3] + C[1/2] + C[3/3] + C[1/2] +$$