

Matrix Chain Multiplication

$$A_1 \cdot A_2 \cdot A_3 \cdot A_4$$

5x4 4x6 6x2 2x7

$m[1,1]$
 A_1 (not multiply with anything)
 5x4

m

	1	2	3	4
1	0			
2		0		
3			0	
4				0

S

	1	2	3	4
1				
2				
3				
4				

$m[1,2]$

$$A_1 \cdot A_2$$

5x4 4x6 = 120 dot products

$m[2,3]$

$$A_2 \cdot A_3$$

4x6 6x2 = 48 dot products

$m[3,4]$

$$A_3 \cdot A_4$$

6x2 2x7 = 84 dot products

m

	1	2	3	4
1	0	120		
2		0	48	
3			0	84
4				0

S

	1	2	3	4
1		1		
2			2	
3				3
4				

$m[1,3]$

$$A_1 \cdot A_2 \cdot A_3 \rightarrow \text{two possibilities}$$

5x4 4x6 6x2

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

5x4 4x6 6x2

$$m[1,1] + m[2,3] + 5 \cdot 4 \cdot 2$$

$$0 + 48 + 40 = 88 \text{ (min)}$$

(babe/1420000000)

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

5x4 4x6 6x2

$$m[1,2] + m[3,3] + 5 \cdot 6 \cdot 2$$

$m[2,4]$

$$A_2 \cdot (A_3 \cdot A_4)$$

4x6 6x2 2x7

$$m[2,2] + m[3,4] + 4 \cdot 6 \cdot 7$$

$$0 + 84 + 168 = 252 \times$$

$$(A_2 \cdot A_3) \cdot A_4$$

4x6 6x2 2x7

$$m[2,3] + m[4,4] + 4 \cdot 2 \cdot 7$$

$$48 + 0 + 56 = 104 \text{ (min)}$$

m

	1	2	3	4
1	0	120	88	
2		0	48	104
3			0	84
4				0

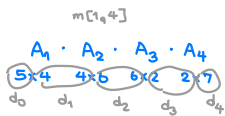
S

	1	2	3	4
1		1	1	
2			2	3
3				3
4				



the values k in the

ခေ့ဒီဟိန္ဒူစာလိပ်ခန်း!



	1	2	3	4
1	0	120	88	158
2		0	48	104
3			0	84
4				0

S	1	2	3	4
1		1	1	3
2			2	3
3				3
4				

$$m[1,4] = \min \left\{ \begin{array}{l} m[1,1] + m[2,4] + 5 \cdot 4 \cdot 7 \\ 0 + 120 + 140 \end{array} \right. \left. \begin{array}{l} m[1,2] + m[3,4] + 5 \cdot 6 \cdot 7 \\ 120 + 84 + 210 \end{array} \right. \left. \begin{array}{l} m[1,3] + m[4,4] + 5 \cdot 2 \cdot 7 \\ 88 + 0 + 70 \end{array} \right. \quad \text{min}$$

$$\begin{array}{l} A_1 \cdot (A_2 \cdot A_3 \cdot A_4) \\ 5 \times 4 \quad (4 \times 6 \quad 6 \times 2 \quad 2 \times 7) \end{array} \quad \begin{array}{l} (A_1 \cdot A_2) \cdot (A_3 \cdot A_4) \\ (5 \times 4 \quad 4 \times 6) \quad (6 \times 2 \quad 2 \times 7) \end{array} \quad \begin{array}{l} (A_1 \cdot A_2 \cdot A_3) \cdot A_4 \\ (5 \times 4 \quad 4 \times 6 \quad 6 \times 2) \quad 2 \times 7 \end{array}$$

$$m[i,j] = \min \{ m[i,k] + m[k+1,j] + d_{i-1} * d_k * d_j \}$$

ခေ့ဒီကောလိပ်ခန်း!

S	1	2	3	4
1		1	1	3
2			2	3
3				3
4				

မလိပ်ခန်းကောလိပ်ခန်း

Time complexity $\frac{n(n-1)}{2} \cdot n$ မလိပ်ခန်းကောလိပ်ခန်း half table
 $O(n^3)$ find minimum