This is given:

matrix	A_0	A_1	A_2	A_3	A_4	A_5
dimension	30×35	35×15	15×5	5×10	10×20	20×25

d_0 30
d_1 35
d_2 15
d_3 5
d_4 10
d_5 20
d_6 25

N	0	1	2	3	4	5
0	0					
1		0				
2			0			
3				0		
4					0	
5						0

Step 1. If there's only one matrix, it costs nothing to multiply since it is already provided.

A_0A_1 $30 \cdot 35 \cdot 15 = 15750$
A_1A_2 $35 \cdot 15 \cdot 5 = 2625$
A_2A_3 $15 \cdot 5 \cdot 10 = 750$
A_3A_4 $5 \cdot 10 \cdot 20 = 1000$
A_4A_5 $10 \cdot 20 \cdot 25 = 5000$

Step 2. Multiplying two matrices together

N	0	1	2	3	4	5
0	0	15750				
1		0	2625			
2			0	750		
3				0	1000	
4					0	5000
5						0

K	0	1	2	3	4	5
0		0				
1			1			
2				2		
3					3	
4						4
5						

$A_0A_1A_2 = \min \begin{cases} \boxed{[\text{if } A_0(A_1 A_2)]} & 0 + 2625 + 30 \cdot 35 \cdot 5 = 7875 \quad k=0 \\ [\text{if } (A_0A_1) \cdot A_2] & 15750 + 0 + 30 \cdot 15 \cdot 5 = 18000 \quad k=1 \end{cases}$

Step 3. Multiplying three matrices together

N	0	1	2	3	4	5
0	0	15750	7875			
1		0	2625			
2			0	750		
3				0	1000	
4					0	5000
5						0

K	0	1	2	3	4	5
0		0	0			
1			1			
2				2		
3					3	
4						4
5						

Note we record k[0][2]=0 because (highlighted in green above), the minimum number that we recorded in N[0][2] came when we did the last multiplication at matrix A_0.

$A_1A_2A_3 \quad \min \begin{cases} A_1 \cdot (A_2 \cdot A_3) & 0 + 750 + 35 \cdot 15 \cdot 10 = 6000 \quad k=1 \\ \boxed{(A_1A_2) \cdot A_3} & 2625 + 0 + 35 \cdot 5 \cdot 10 = 4375 \quad k=2 \end{cases}$

N	0	1	2	3	4	5
0	0	15750	7875			
1		0	2625	4375		
2			0	750		
3				0	1000	
4					0	5000
5						0

K	0	1	2	3	4	5
0		0	0			
1			1	2		
2				2		
3					3	
4						4
5						

k[1][2]=2 because (highlighted in green above), the minimum number that we recorded in N[1][3] came wher we did the last multiplication at matrix A_0

$i=2$, $j=4$: $A_2A_3A_4$

$$\min\begin{cases} (A_2)\cdot(A_3A_4) & 0 + 1000 + 15\cdot5\cdot20 = 2500 & k=2 \\ (A_2\cdot A_3)\cdot(A_4) & 750 + 0 + 15\cdot10\cdot20 = 3750 & k=3 \end{cases}$$

$i=3$, $j=5$: $A_3A_4A_5$

$$\min\begin{cases} (A_3)\cdot(A_4A_5) & 0+5000 + 5\cdot10\cdot25 = 6250 & k=3 \\ (A_3A_4)\cdot(A_5) & 1000 + 0 + 5\cdot20\cdot25 = 3500 & k=4 \end{cases}$$

N	0	1	2	3	4	5
0	0	15750	7875			
1		0	2625	4375		
2			0	750	2500	
3				0	1000	3500
4					0	5000
5						0

K	0	1	2	3	4	5
0		0	0			
1			1	2		
2				2	2	
3					3	4
4						4
5						

Step 4. Multiplying four matrices together

$i=0$, $j=3$: $A_0A_1A_2A_3$

$$\min\begin{cases} (A_0)(A_1A_2A_3) & 0 + 4375 + 30\cdot35\cdot10 = 14875 & k=0 \\ (A_0A_1)(A_2A_3) & 15750 + 750 + 30\cdot15\cdot10 = 21000 & k=1 \\ (A_0A_1A_2)(A_3) & 7875 + 0 + 30\cdot5\cdot10 = 9375 & k=2 \end{cases}$$

$i=1$, $j=4$: $A_1A_2A_3A_4$

$$\min\begin{cases} (A_1)(A_2A_3A_4) & 0 + 2500 + 35\cdot15\cdot20 = 13000 & k=1 \\ (A_1A_2)(A_3A_4) & 2625 + 1000 + 35\cdot5\cdot20 = 7125 & k=2 \\ (A_1A_2A_3)(A_4) & 4375 + 0 + 35\cdot10\cdot20 = 11375 & k=3 \end{cases}$$

$i=2$, $j=5$: $A_2A_3A_4A_5$

$$\min\begin{cases} A_2|A_3A_4A_5 & 0+3500 + 15\cdot5\cdot25 = 5375 & k=2 \\ A_2A_3|A_4A_5 & 750+5000 + 15\cdot10\cdot25 = 9500 & k=3 \\ A_2A_3A_4|A_5 & 2500 + 0 + 15\cdot20\cdot25 = 10\,000 & k=4 \end{cases}$$

N	0	1	2	3	4	5
0	0	15750	7875	9375		
1		0	2625	4375	7125	
2			0	750	2500	5375
3				0	1000	3500
4					0	5000
5						0

K	0	1	2	3	4	5
0		0	0	2		
1			1	2	2	
2				2	2	2
3					3	4
4						4
5						

Step 5. Multiplying five matrices together

$i=0$, $j=4$: $A_0A_1A_2A_3A_4$

$$\min\begin{cases} A_0|A_1A_2A_3A_4 & 0 + 7125 + 30\cdot35\cdot20 = 28125 & k=0 \\ A_0A_1|A_2A_3A_4 & 15750 + 2500 + 30\cdot15\cdot20 = 27250 & k=1 \\ A_0A_1A_2|A_3A_4 & 7875 + 1000 + 30\cdot5\cdot20 = 11875 & k=2 \\ A_0A_1A_2A_3|A_4 & 9375 + 0 + 30\cdot10\cdot20 = 15375 & k=3 \end{cases}$$

$i=1$, $j=5$: $A_1A_2A_3A_4A_5$

$$\min\begin{cases} A_1|A_2A_3A_4A_5 & 0 + 5375 + 35\cdot15\cdot25 = 18500 & k=1 \\ A_1A_2|A_3A_4A_5 & 2625 + 3500 + 35\cdot5\cdot25 = 10500 & k=2 \\ A_1A_2A_3|A_4A_5 & 4375 + 5000 + 35\cdot10\cdot25 = 18125 & k=3 \\ A_1A_2A_3A_4|A_5 & 7125 + 0 + 35\cdot20\cdot25 = 24625 & k=4 \end{cases}$$

N	0	1	2	3	4	5
0	0	15750	7875	9375	11875	
1		0	2625	4375	7125	10500
2			0	750	2500	5375
3				0	1000	3500
4					0	5000
5						0

K	0	1	2	3	4	5
0		0	0	2	2	
1			1	2	2	2
2				2	2	2
3					3	4
4						4
5						

Step 6. Multiplying six matrices together

$i=0$
$j=5$

min

$A_0 | A_1 A_2 A_3 A_4 A_5$ $\quad 0 + 10500 + 30 \cdot 35 \cdot 25 = 36750$ k=0

$A_0 A_1 | A_2 A_3 A_4 A_5$ $\quad 15750 + 5375 + 30 \cdot 15 \cdot 25 = 32375$ k=1

$A_0 A_1 A_2 | A_3 A_4 A_5$ $\quad 7875 + 3500 + 30 \cdot 5 \cdot 25 = 15125$ k=2

$A_0 A_1 A_2 A_3 | A_4 A_5$ $\quad 9375 + 5000 + 30 \cdot 10 \cdot 25 = 21875$ k=3

$A_0 A_1 A_2 A_3 A_4 | A_5$ $\quad 11875 + 0 + 30 \cdot 20 \cdot 25 = 26875$ k=4

N	0	1	2	3	4	5
0	0	15750	7875	9375	11875	15125
1		0	2625	4375	7125	10500
2			0	750	2500	5375
3				0	1000	3500
4					0	5000
5						0

K	0	1	2	3	4	5
0		0	0	2	2	2
1			1	2	2	2
2				2	2	2
3					3	4
4						4
5						

Finished building N table (left). It says that the minimum number of scalar operations it will take to multiply these 6 matrices together is 15125. The k table (right) explains how the chain of matrices was parenthesized which minimized the number of scalar operations. Interpreting the k-table gives the solution

$$((A_0) \times (A_1 \times A_2)) \times ((A_3 \times A_4) \times (A_5))$$

k[0][5] determines the last multiplication, effectively splitting the chain of matrices into to large matrices from A_0…A_2 on the left and A_3…A_5 on the right.

k[0][2] describes how to multiply the left chain (from A_0…A_2)

k[3][5] describes how to multiply the right chain (from A_3…A_5)