

# Arrays - 5

# In This Lecture

Minimum operations to make all elements of a matrix equal

# Minimum operations to make all elements of a matrix equal

Given an integer  $K$  and a matrix of  $N$  rows and  $M$  columns, the task is to find the minimum number of operations required to make all the elements of the matrix equal. In a single operation,  $K$  can be added to or subtracted from any element of the matrix. Print -1 if it is impossible to do so.

Input:  $\text{mat}[][] = \{\{2, 4\}, \{22, 24\}\}, K = 2$

Output: 20

$$22 - 10(2) = 2$$

22

# Minimum operations to make all elements of a matrix equal

Input: mat[][] = {

Explanation:

{3, 63, 42},

{18, 12, 12},

{15, 21, 18},

{33, 84, 24}},

K = 3

Output: 63

$$a + \underset{\downarrow}{\text{sum}} \longrightarrow b$$

$$a + K * n = b$$

$$n = \frac{b - a}{K}$$

must be an  
integer

$$n = \frac{K * b' - K * a'}{K} = (b' - a')$$

# Minimum operations to make all elements of a matrix equal

Input: mat[][] = {

Explanation:

i 0 {3, 63, 42},  
1 {18, 12, 12},  
2 {15, 21, 18},  
3 {33, 84, 24}},

K = 3

Output: 63

$$a = \begin{matrix} & 0 & 1 & 2 & 3 & 4 & 5 & 6 \\ & 3 & 63 & 42 & 18 & 12 & 12 & \end{matrix}$$

$$m = 12 = (12 - 3) / 3$$

$$b[i] = 3 = 3$$

$$(1, 0) \downarrow$$

$$(i, j) \rightarrow i * m + j$$

$$63 \rightarrow 12$$

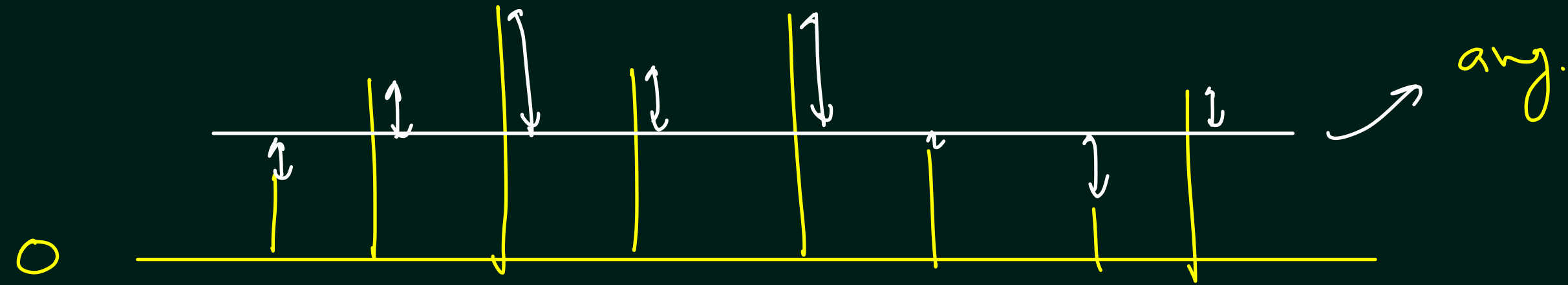
$$(63 - 12) / 3$$

$$(1, 1) \rightarrow 4$$

$$(2, 0) \rightarrow 6 + 0 = 17$$

$$51 / 3$$

# Minimum operations to make all elements of a matrix equal



$\left. \begin{array}{c} \vdots \\ \vdots \\ \vdots \end{array} \right\} \begin{array}{c} 2 \\ 2 \\ 2 \end{array}$

$\begin{array}{cccc} 2 & 4 & 6 & 8 & 10 \\ 2 & 1 & 0 & 1 & 2 \end{array} \rightarrow \min = 6$

$\begin{array}{cccc} 2 & 2 & 4 & 100 \\ 24 & 24 & 22 & 74 \\ 12 & 12 & 11 & 37 \end{array} \rightarrow$

$\frac{108}{4} = 27$

$K = 2$

$26$

# Minimum operations to make all elements of a matrix equal



$\downarrow \downarrow$   
 0 0 0 0 0 0  
 0 1 2 3 4 5

$n = 6$

$m_1 \rightarrow 3^{rd}$   
 $m_2 = 2^{nd}$

$\downarrow$   
 2, 2, 4, 6, 100

$e$

$$e + k \times n = e_2$$

$$k \times n = (e_2 - e)$$

$$\rightarrow n = \frac{(e_2 - e)}{k} \text{ an integer}$$

$$= \frac{(k \times e_2' - k \times e')}{k}$$

is an integer