

# 5.9.7

EE25BTECH11052 - Shriyansh Kalpesh Chawda

## Question

A part of monthly hostel charges in a college hostel are fixed and the remaining depends on the number of days one has taken food in the mess. When a student A takes food for 25 days, he has to pay ₹4,500, whereas a student B who takes food for 30 days, has to pay ₹5,200. Find the fixed charges per month and the cost of food per day.

(10, 2019)

## Solution

Let  $x$  be the fixed charge and  $y$  be the cost of food per day.

The system according to the information is

$$x + 25y = 4500 \quad (1)$$

$$x + 30y = 5200 \quad (2)$$

In matrix form:

$$\begin{pmatrix} 1 & 25 \\ 1 & 30 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 4500 \\ 5200 \end{pmatrix}. \quad (3)$$

Let

$$A = \begin{pmatrix} 1 & 25 \\ 1 & 30 \end{pmatrix}, \quad \mathbf{b} = \begin{pmatrix} 4500 \\ 5200 \end{pmatrix}. \quad (4)$$

Solving it using Gauss-Jordan elimination, we get

$$\left[ \begin{array}{cc|c} 1 & 25 & 4500 \\ 1 & 30 & 5200 \end{array} \right] \xrightarrow{R_2 \rightarrow R_2 - R_1} \left[ \begin{array}{cc|c} 1 & 25 & 4500 \\ 0 & 5 & 700 \end{array} \right] \quad (5)$$

$$\xrightarrow{R_2 \rightarrow \frac{1}{5}R_2} \left[ \begin{array}{cc|c} 1 & 25 & 4500 \\ 0 & 1 & 140 \end{array} \right] \quad (6)$$

$$\xrightarrow{R_1 \rightarrow R_1 - 25R_2} \left[ \begin{array}{cc|c} 1 & 0 & 1000 \\ 0 & 1 & 140 \end{array} \right] \quad (7)$$

From the reduced row echelon form, we have the solution:

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1000 \\ 140 \end{pmatrix} \quad (8)$$

Therefore,

$$x = 1000 \quad (\text{fixed charge}), \quad y = 140 \quad (\text{cost per day}). \quad (9)$$

