

5.9.14

EE25BTECH11060 - V.Namaswi

Question

On her birthday Seema decided to donate some money to children of an orphanage home. If there were 8 children less, every one would have got 10 Rupees more. However, if there were 16 children more, every one would have got 10 Rupees less. Using matrix method, find the number of children and the amount distributed by Seema. What values are reflected by Seema's decision ?

Solution

Let, Number of children = c and Amount = a

Given,

$$ca = (c - 8)(a + 10) = (c + 16)(a - 10) \quad (1)$$

From 1,

$$10c - 8a = 80 \quad (2)$$

$$10c - 16a = -160 \quad (3)$$

From 2,

$$\begin{pmatrix} 5 \\ -4 \end{pmatrix}^T \begin{pmatrix} c \\ a \end{pmatrix} = 40 \quad (4)$$

From 3,

$$\begin{pmatrix} 5 \\ -8 \end{pmatrix}^T \begin{pmatrix} c \\ a \end{pmatrix} = -80 \quad (5)$$

$$\begin{pmatrix} 5 & -4 \\ 5 & -8 \end{pmatrix} \begin{pmatrix} c \\ a \end{pmatrix} = \begin{pmatrix} 40 \\ -80 \end{pmatrix} \quad (6)$$

Forming augmented matrix

$$\left(\begin{array}{cc|c} 5 & -4 & 40 \\ 5 & -8 & -80 \end{array} \right) \quad (7)$$

Replace

$$R_2 \rightarrow R_2 - R_1$$

$$\left(\begin{array}{cc|c} 5 & -4 & 40 \\ 0 & -4 & -120 \end{array} \right) \quad (8)$$

Replace

$$R_2 \rightarrow R_2 / -4$$

$$\left(\begin{array}{cc|c} 5 & -4 & 40 \\ 0 & 1 & 30 \end{array}\right) \quad (9)$$

Replace

$$R_1 \rightarrow R_1 + 4R_2$$

$$\left(\begin{array}{cc|c} 5 & 0 & 160 \\ 0 & 1 & 30 \end{array}\right) \quad (10)$$

Replace

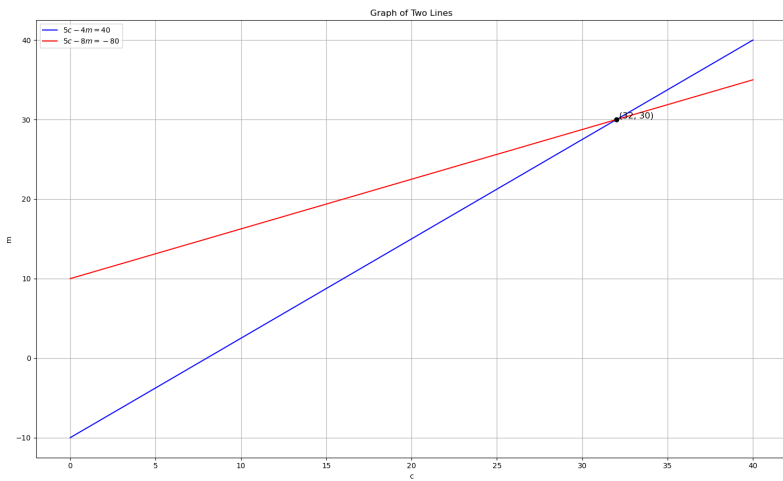
$$R_1 \rightarrow R_1/5$$

$$\left(\begin{array}{cc|c} 1 & 0 & 32 \\ 0 & 1 & 30 \end{array}\right) \quad (11)$$

so,

$$c = 32 \quad a = 30 \quad (12)$$

Refer fig



(13)