CBSE Maths Questions 2007

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Get latex-tikz codes from

https://github.com/PeriPriyanka/cbsemathsquestions/2007_question3

1 Problem

(CBSE 2007-Question 3) solve the values of X and Y.

$$\frac{X+1}{2}+\frac{Y-1}{3}=8 \tag{1.0.1}$$

$$\frac{X-1}{3}+\frac{Y+1}{2}=9 \tag{1.0.2}$$

2 Solution

Consider the equations 1.0.1 and 1.0.2 given in the problem statement.

$$\frac{X+1}{2}+\frac{Y-1}{3}=8 \tag{2.0.1}$$

$$\frac{X-1}{3}+\frac{Y+1}{2}=9 \tag{2.0.2}$$

The above equations 2.0.1 and 2.0.2 can be rearranged as the following equations

$$3X+2Y=47 \tag{2.0.3}$$

$$2X+3Y=53 \tag{2.0.4}$$

The solution can be found by solving the above system of linear equations.
System of linear equations are defined as

$$\mathbf{AX}=\mathbf{B} \tag{2.0.5}$$

From the equations 2.0.3 and 2.0.4,

$$\mathbf{A}=\begin{pmatrix}3 & 2\\ 2 & 3\end{pmatrix} \tag{2.0.6}$$

$$\mathbf{X}=\begin{pmatrix}X\\ Y\end{pmatrix} \tag{2.0.7}$$

$$\mathbf{B}=\begin{pmatrix}47\\ 53\end{pmatrix} \tag{2.0.8}$$

Substituting the values of **A**, **X** and **B** in the equation 2.0.5 We get,

$$\begin{pmatrix}3 & 2\\ 2 & 3\end{pmatrix}\begin{pmatrix}X\\ Y\end{pmatrix}=\begin{pmatrix}47\\ 53\end{pmatrix} \tag{2.0.9}$$

Considering the augmented matrix **AB**

$$\mathbf{AB}=\begin{pmatrix}3 & 2 & 47\\ 2 & 3 & 53\end{pmatrix} \tag{2.0.10}$$

Performing the row operation on **AB**

$$R_2 \to 3R_2-2R_1$$

$$\mathbf{AB}=\begin{pmatrix}3 & 2 & 47\\ 0 & 5 & 65\end{pmatrix} \tag{2.0.11}$$

$$\begin{pmatrix}3 & 2\\ 0 & 5\end{pmatrix}\begin{pmatrix}X\\ Y\end{pmatrix}=\begin{pmatrix}47\\ 65\end{pmatrix} \tag{2.0.12}$$

$$3X+2Y=47 \tag{2.0.13}$$

$$5Y=65 \tag{2.0.14}$$

By solving equations 2.0.14 we get,

$$Y=13 \tag{2.0.15}$$

and by solving equation 2.0.13 we get ,

$$X=7 \tag{2.0.16}$$

Therefore, X=7 and Y= 13 are solutions to the given equations 1.0.1 and 1.0.2