Pair of linear equation in two variables

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July 19, 2023

Class 10^{th} Maths - Chapter 3

1. On comparing $\frac{a_1}{a_2}$, $\frac{b_1}{b_2}$, and $\frac{c_1}{c_2}$ Find out whether the following pair of linear equation are consistent or inconsistent

$$\frac{3}{2}x + \frac{5}{3}y = 7, \tag{1}$$
$$9x - 10y = 14 \tag{2}$$

Solution

$$\begin{pmatrix} \frac{3}{2} & \frac{5}{3} \\ 9 & -10 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 7 \\ 14 \end{pmatrix} \tag{3}$$

$$\tag{4}$$

$$\mathbf{x} = \frac{\begin{vmatrix} \mathbf{b} & \mathbf{a_1} \end{vmatrix}}{\begin{vmatrix} \mathbf{a_1} & \mathbf{a_2} \end{vmatrix}} = \frac{\begin{vmatrix} 7 & 14 \\ \frac{3}{2} & 9 \end{vmatrix}}{\begin{vmatrix} \frac{3}{2} & \frac{5}{3} \\ 9 & -10 \end{vmatrix}} = \left| \frac{7\times 9 - \frac{3}{2}\times 14}{\frac{3}{2}\times -10 - \frac{5}{3}\times 9} \right| = \left| \frac{63-23}{-15-15} \right| = \left| \frac{42}{-30} \right| = \left| \frac{-7}{5} \right| \tag{5}$$

$$\mathbf{y} = \frac{\begin{vmatrix} \mathbf{a_1} & \mathbf{b} \end{vmatrix}}{\begin{vmatrix} \mathbf{a_1} & \mathbf{a_2} \end{vmatrix}} = \frac{\begin{vmatrix} \frac{3}{2} & 7 \\ 9 & 14 \end{vmatrix}}{\begin{vmatrix} \frac{3}{2} & \frac{5}{3} \\ 9 & -10 \end{vmatrix}} = \frac{\left| \frac{3}{2} \times 14 - 7 \times 9 \right|}{\left| \frac{3}{2} \times 10 - \frac{5}{3} \times 9 \right|} = \frac{21 - 63}{-30} = \frac{-42}{-30} = \frac{7}{5} \tag{6}$$

Therefore we can conclude that pair of equation is consistent with unique solution