Exercise 3D

Question 6:

$x + 2y - 5 = 0$

$3x + ky + 15 = 0$

These equations are of the form of

$$a_1x + b_1y + c_1 = 0, \quad a_2x + b_2y + c_2 = 0$$

where $a_1 = 1, b_1 = 2, c_1 = -5$

$a_2 = 3, b_2 = k, c_2 = 15$

for a unique solution, we must have

$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \text{ i.e., } \frac{1}{3} \neq \frac{2}{k} \Rightarrow k \neq 6$$

Thus for all real value of k other than 6, the given system of equation will have unique solution

(ii) For no solution we must have

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

$$\frac{1}{3} = \frac{2}{k} \neq \frac{-5}{15}$$

$$\frac{1}{3} = \frac{2}{k} \text{ and } \frac{2}{k} \neq \frac{-5}{15}$$

Therefore k = 6

Hence the given system will have no solution when k = 6.

Question 7:

$x + 2y - 3 = 0, \ 5x + ky + 7 = 0$

These equations are of the form

$$a_1x + b_1y + c_1 = 0, \ a_2x + b_2y + c_2 = 0$$

where, $a_1 = 1, \ b_1 = 2, \ c_1 = -3$ and $a_2 = 5, \ b_2 = k, \ c_2 = 7$

(i) For a unique solution we must have

$$\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \text{ i.e., } \frac{1}{5} \neq \frac{2}{k}$$

$$k \neq 10$$

Thus, for all real value of k other than 10

The given system of equation will have a unique solution.

(ii) For no solution we must have

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

$$\frac{1}{5} = \frac{2}{k} \neq \frac{-3}{7} \Rightarrow \frac{1}{5} = \frac{2}{k} \text{ or } \frac{2}{k} \neq \frac{-3}{7}$$

$$k = 10 \text{ or } k \neq \frac{-14}{3}$$

Hence the given system of equations has no solution if

$k = 10, k \neq -\frac{14}{3}$

For infinite number of solutions we must have

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

$$\frac{1}{5} = \frac{5}{k} = \frac{-3}{7}$$

This is never possible since

$$\frac{1}{5} \neq \frac{-3}{7}$$

There is no value of k for which system of equations has infinitely many solutions

*********** END **********