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Class: - 9th

Date: 30/05/2020

Subject: - Mathematics

Solution of a Pair of Linear Equations in Two Variables

Q. Find the value of k which the given system of equations has infinitely many solutions.

$$\begin{aligned} kx + 3y &= k-3 \\ 12x + ky &= k \end{aligned}$$

Solution: Given the given system of equations have infinitely many solutions.

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

$$\Rightarrow \frac{k}{12} = \frac{3}{k} = \frac{k-3}{k}$$

$$\Rightarrow \frac{k}{12} = \frac{3}{k}$$

$$\Rightarrow k^2 = 36$$

$$\Rightarrow k = \pm\sqrt{36}$$

$$\therefore k = \pm 6$$

$$\frac{3}{k} = \frac{k-3}{k}$$

$$\Rightarrow k-3 = 3$$

$$\Rightarrow k = 6$$

$$\therefore k = 6$$

$$\frac{k}{12} = \frac{k-3}{k}$$

$$\Rightarrow k^2 = 12k - 36$$

$$\Rightarrow k^2 - 12k + 36 = 0$$

$$\Rightarrow k^2 - 6k - 6k + 36 = 0$$

$$\Rightarrow (k-6)^2 = 0$$

$$\therefore k = 6$$

The common value of $k = 6$

Hence the given system of equations has infinitely many solutions. When $k = 6$ Ans.

Do your self

(1) $2x + 3y = 7$

$$(k-1)x + (k+2)y = 3k$$

(2) $kx + 3y = 2k+1$

$$2(k+1)x + 9y = 7k+1$$

(3) $5x + 2y = 2k$

$$2(k+1)x + ky = 3k+4$$

(4) $(k-3)x + 3y = k$

$$kx + ky = 12$$

Q. Find the values of a and b for which the following pair of linear equations have an infinite number of solutions:-

$$2x + 3y = 7$$

$$(a-b)x + (a+b)y = 3a+b-2$$

Solution:- The given system of equations have infinitely many solutions.

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

$$\Rightarrow \frac{2}{a-b} = \frac{3}{a+b} = \frac{7}{3a+b-2}$$

$$\Rightarrow \frac{2}{a-b} = \frac{3}{a+b}$$

$$\Rightarrow 3a - 3b = 2a + 2b$$

$$\Rightarrow a = 5b \quad \text{--- (1)}$$

$$\frac{3}{a+b} = \frac{7}{3a+b-2}$$

$$\Rightarrow 7a + 7b = 9a + 3b - 6$$

$$\Rightarrow 7a - 9a + 7b - 3b = -6$$

$$\Rightarrow -2a + 4b = -6$$

$$\Rightarrow -2(5b) + 4b = -6$$

$$\Rightarrow -10b + 4b = -6$$

$$\Rightarrow -6b = -6$$

$$\therefore b = 1$$

Putting the value of b in eqn (1)

$$a = 5b$$

$$a = 5 \times 1 = 5$$

Hence, the required values are $a = 5$ and $b = 1$

Ans

Do your self

Find the values of a and b for which each of the following systems of linear eqns. has infinite no. of solutions:-

(1) $2x - 3y = 7$

$$(a+b)x - (a+b-3)y = 7a+b$$

(2) $2x + 3y = 7$

$$(a+b)x + (2a-b)y = 21$$

