Short Answer Type Questions – I

[2 marks]

Que 1. Is the following pair of linear equations consistent? Justify your answer.

$$\boldsymbol{2ax + by = a, \quad 4ax + 2by - 2a = 0; \qquad a, b \neq 0}$$

Sol. Yes,

Here, $\frac{a_1}{a_2} = \frac{2a}{4a} = \frac{1}{2}, \qquad \frac{b_1}{b_2} = \frac{b}{2b} = \frac{1}{2}, \qquad \frac{c_1}{c_2} = \frac{-a}{-2a} = \frac{1}{2}$

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

$\therefore$ The given system of equations is consistent.

Que 2. For all real value of c, the pair of equations

$$\boldsymbol{x - 2y = 8, \quad 5x + 10y = c}$$

Have a unique solution. Justify whether it is true or false.

Sol. Here, $\frac{a_1}{a_2} = \frac{1}{5}, \frac{b_1}{b_2} = \frac{-2}{+10} = \frac{-1}{5}, \frac{c_1}{c_2} = \frac{8}{c}$

Since $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

So, for all real values of c, the given pair of equations have a unique solution.

$\therefore$ The given statement is true.

Que 3. Does the following pair of equations represent a pair of coincident lines? Justify your answer.

$$\boldsymbol{\frac{x}{2} + y + \frac{2}{5} = 0, \quad 4x + 8y + \frac{5}{16} = 0.}$$

Sol. Here, $a_1 = \frac{1}{2},\ b_1 = 1,\ c_1 = \frac{2}{5}$ and $a_2 = 4,\ b_2 = 8, c_2 = \frac{5}{16}$

$$\frac{a_1}{a_2} = \frac{\frac{1}{2}}{4} = \frac{1}{8}, \qquad \frac{b_1}{b_2} = \frac{1}{8}, \qquad \frac{c_1}{c_2} = \frac{\frac{2}{5}}{\frac{5}{16}} = \frac{32}{25}$$

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

$\therefore$ The given system does not represent a pair of coincident lines.

Que 4. If x = a, y = b is the solution of the pair of equation x – y = 2 and x + y = 4 then find the value of a and b.

Sol. $x - y = 2$ ...(i)

$x + y = 4$ ...(ii)

On adding (i) and (ii), we get 2x = 6 or x = 3

From (i), 3 – y = 2 ⇒ y = 1

$\therefore \; a = 3, \; b = 1$

On comparing the ratios $\frac{a_1}{a_2}, \frac{b_1}{b_2}$ *and* $\frac{c_1}{c_2}$, find out whether the following pair of linear equations is consistent or inconsistent. (5 to 6)

Que 5. $\frac{3}{2}x + \frac{5}{3}y = 7$; **Q6.** $\frac{4}{3}x + 2y = 8$;

$9x - 10y = 14$ $2x + 3y = 12$

Sol 5. We have, $\frac{3}{2}x + \frac{5}{3}y = 7$ **...(i)**

$9x - 10y = 14$ **...(ii)**

Here $a_1 = \frac{3}{2}, b_1 = \frac{3}{5}, c_1 = 7$

$a_2 = 9, b_2 = -10, c_2 = 14$

Thus. $\frac{a_1}{a_2} = \frac{3}{2 \times 9} = \frac{1}{6}, \frac{b_1}{b_2} = \frac{5}{3 \times (-10)} = -\frac{1}{6}$

Hence, $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$. So, it has a unique solution and it is consistent.

Sol 6. We have, $\frac{4}{3}x + 2y = 8$ **...(i)**

$2x + 3y = 12$ **...(ii)**

Here, $a_1 = \frac{4}{3}, b_1 = 2, c_1 = 8$

And $a_2 = 2, b_2 = 3, c_2 = 12$

Thus, $\frac{a_1}{a_2} = \frac{4}{3 \times 2} = \frac{2}{3}$; $\frac{b_1}{b_2} = \frac{2}{3}$; $\frac{c_1}{c_2} = \frac{8}{12} = \frac{2}{3}$

Since $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$, so equations (i) and (ii) represent coincident lines.

Hence the pair of linear equations is consistent with infinitely many solutions.

On comparing the ratios $\frac{a_1}{a_2}, \frac{b_1}{b_2}$ and $\frac{c_1}{c_2}$, find out whether the lines representing the following pair of linear equations intersect at a point, are parallel or coincident: (7 to 9).

Que 7. $\mathbf{5x - 4y + 8 = 0}$

$\mathbf{7x + 6y - 9 = 0}$

Que 8. $\mathbf{9x + 3y + 12 = 0}$

$\mathbf{18x + 6y + 24 = 0}$

Que 9. $\mathbf{6x - 3y + 10 = 0}$

$\mathbf{2x - y + 9 = 0}$

Sol 7. We have, $5x - 4y + 8 = 0$ …(i)

$7x + 6y - 9 = 0$ …(ii)

Here, $a_1 = 5, b_1 = -4, c_1 = 8$

And, $a_2 = 7, b_2 = 6, c_2 = -9$

Here, $\frac{a_1}{a_2} = \frac{5}{7}$ and $\frac{b_1}{b_2} = -\frac{4}{6} = -\frac{2}{3}$

Since $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$. So, equations (i) and (ii) represent intersecting lines.

Sol 8. We have, $9x + 3y + 12 = 0$ …(i)

$18x + 6y + 24 = 0$ …(ii)

Here, $a_1 = 9, b_1 = 3, c_1 = 12$

And $a_2 = 18, b_2 = 6, c_2 = 24$

$\frac{a_1}{a_2} = \frac{9}{18} = \frac{1}{2}$; $\frac{b_1}{b_2} = \frac{3}{6} = \frac{1}{2}$; $\frac{c_1}{c_2} = \frac{12}{24} = \frac{1}{2}$

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

So equations (i) and (ii) represent coincident lines.

Sol 9. We have $6x - 3y + 10 = 0$ …(i)

$2x - y + 9 = 0$ …(ii)

Here, $a_1 = 6,\ b_1 = \ -3,\ c_1 = 10$

$a_2 = 2,\ b_2 = \ -1,\ c_2 = 9$

And $\frac{a_1}{a_2} = \frac{6}{2} = 3,$ $\frac{b_1}{b_2} = \frac{-3}{-1} = 3,$ $\frac{c_1}{c_2} = \frac{10}{9}$

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

So, equations (i) and (ii) represent parallel lines.