



NCERT Solutions for Class 10th Maths Chapter 3 Pair of Linear Equations in Two Variables Ex 3.6

Question-31

Solve the following pairs of equations by reducing them to a pair of linear equation:

(i) $\frac{1}{2x} + \frac{1}{3y} = 2$

$\frac{1}{3x} + \frac{1}{2y} = \frac{13}{6}$

(ii) $\frac{2}{\sqrt{x}} + \frac{3}{\sqrt{y}} = 2$

$\frac{4}{\sqrt{x}} - \frac{9}{\sqrt{y}} = -1$

Solution:

(i) $\frac{1}{2x} + \frac{1}{3y} = 2$ (1)

$\frac{1}{3x} + \frac{1}{2y} = \frac{13}{6}$ (2)

Let $\frac{1}{x} = a, \frac{1}{y} = b$

$\frac{a}{2} + \frac{b}{3} = 2$ (3)

$\frac{a}{3} + \frac{b}{2} = \frac{13}{6}$ (4)

Multiplying (3) and (4) by 6

$\Rightarrow 3a + 2b = 12$ (5)

$\Rightarrow 2a + 3b = 13$ (6)

(5) $\times 2$ and (6) $\times 3$

$6a + 4b = 24$

$6a + 9b = 39$

Subtracting $-5b = -15$

$b = 3 \Rightarrow y = \frac{1}{b} = \frac{1}{3}$

put $b = 3$ in (5)

$3a + 2(3) = 12$

$3a = 6$

$a = 2 \Rightarrow x = \frac{1}{a} = \frac{1}{2}$

$\therefore x = \frac{1}{2}, y = \frac{1}{3}$

$$(ii) \frac{2}{\sqrt{x}} + \frac{3}{\sqrt{y}} = 2$$

$$\frac{4}{\sqrt{x}} - \frac{9}{\sqrt{y}} = -1$$

$$\frac{2}{\sqrt{x}} + \frac{3}{\sqrt{y}} = 2 \dots\dots\dots (1)$$

$$\frac{4}{\sqrt{x}} - \frac{9}{\sqrt{y}} = -1 \dots\dots\dots (2)$$

$$\text{Let } \frac{1}{\sqrt{x}} = a, \frac{1}{\sqrt{y}} = b$$

$$2a + 3b = 2 \dots\dots\dots (3)$$

$$4a - 9b = -1 \dots\dots\dots (4)$$

$$(3) \times 2 \Rightarrow 4a + 6b = 4$$

$$\underline{(4) \Rightarrow 4a - 9b = -1}$$

$$15b = 5$$

$$\therefore b = \frac{5}{15} = \frac{1}{3}$$

$$\Rightarrow b = \frac{1}{\sqrt{y}} = \frac{1}{3}$$

$$\therefore \sqrt{y} = 3$$

$$\Rightarrow y = 9$$

$$(3) \Rightarrow 2a + 3\left(\frac{1}{3}\right) = 2$$

$$2a + 1 = 2$$

$$2a = 2 - 1$$

$$a = \frac{1}{2}$$

$$a = \frac{1}{\sqrt{x}} = \frac{1}{2}$$

$$\Rightarrow \sqrt{x} = 2, x = 4$$

$$\therefore x = 4, y = 9$$

Question-32

Solve the following pairs of equations by reducing them to a pair of linear equation:

$$(i) \frac{4}{x} + 3y = 14$$

$$\frac{3}{x} - 4y = 23$$

$$(ii) \frac{5}{x-1} + \frac{1}{y-2} = 2$$

$$\frac{6}{x-1} - \frac{3}{y-2} = 1$$

Solution:

$$(i) \frac{4}{x} + 3y = 14$$

$$\frac{3}{x} - 4y = 23$$

$$\text{Let } \frac{1}{x} = a$$

$$4a + 3y = 14 \dots\dots\dots (3)$$

$$3a - 4y = 23 \dots\dots\dots (4)$$

$$(3) \times 4 \Rightarrow 16a + 12y = 56$$

$$\underline{(4) \times 3 \Rightarrow 9a - 12y = 69}$$

$$\text{Adding } 25a = 125$$

$$a = \frac{125}{25} = 5, a = \frac{1}{x} = 5$$

$$\therefore x = \frac{1}{5}$$

Substituting in (3), $a = 5$ we get

$$4(5) + 3y = 14$$

$$3y = 14 - 20 = -6$$

$$y = -2$$

$$\therefore x = \frac{1}{5}, y = -2$$

$$(ii) \frac{5}{x-1} + \frac{1}{y-2} = 2$$

$$\frac{6}{x-1} - \frac{3}{y-2} = 1$$

$$\frac{5}{x-1} + \frac{1}{y-2} = 2 \dots\dots\dots (1)$$

$$\frac{6}{x-1} - \frac{3}{y-2} = 1 \dots\dots\dots (2)$$

$$\text{Let } \frac{1}{x-1} = a, \frac{1}{y-2} = b$$

Substituting a, b in (1) and (2) we get,

$$5a + b = 2 \dots\dots\dots (3)$$

$$6a - 3b = 1 \dots\dots\dots (4)$$

$$(3) \times 3 \Rightarrow 15a + 3b = 6$$

$$(4) \Rightarrow \frac{6a - 3b = 1}{21a = 7}$$

$$\therefore a = \frac{7}{21} = \frac{1}{3}$$

Substituting in eq. (3)

$$\frac{5}{3} + b = 2$$

$$\Rightarrow b = 2 - \frac{5}{3} = \frac{1}{3}$$

$$\therefore a = \frac{1}{3}, b = \frac{1}{3}$$

Substitute in $\frac{1}{x-1} = a$

$$\frac{1}{x-1} = \frac{1}{3}$$

$$x - 1 = 3 \Rightarrow x = 4$$

$$\frac{1}{y-2} = b$$

$$\frac{1}{y-2} = \frac{1}{3}$$

$$\Rightarrow y - 2 = 3$$

$$\Rightarrow y = 5$$

Hence $x = 4, y = 5$.

Question-33

Solve the following pairs of equations by reducing them to a pair of linear equation:

$$(i) \frac{7x - 2y}{xy} = 5$$

$$\frac{8x + 7y}{xy} = 15$$

$$(ii) 6x + 3y = 6xy$$

$$2x + 4y = 5xy$$

Solution:

$$(i) \frac{7x - 2y}{xy} = 5$$

$$\frac{8x + 7y}{xy} = 15$$

$$\frac{7x - 2y}{xy} = 5 \dots\dots\dots (1)$$

$$\frac{8x + 7y}{xy} = 15 \dots\dots\dots (2)$$

Separating the fraction

$$\frac{7x}{xy} - \frac{2y}{xy} = 5$$

$$\frac{7}{y} - \frac{2}{x} = 5 \Rightarrow \frac{2}{x} + \frac{7}{y} = 5$$

$$\frac{8x}{xy} + \frac{7y}{xy} = 15$$

$$\frac{8}{y} + \frac{7}{x} = 15 \Rightarrow \frac{7}{x} + \frac{8}{y} = 15$$

$$\text{Let } \frac{1}{x} = a, \frac{1}{y} = b$$

$$-2a + 7b = 5 \dots\dots\dots (1)$$

$$7a + 8b = 15 \dots\dots\dots (2)$$

Multiply (1) with 7, (2) with 2, we get.

$$-14a + 49b = 35$$

$$14a + 16b = 30$$

$$65b = 65$$

$$b = 1$$

$$b = \frac{1}{y} = 1$$

$$\Rightarrow y = 1$$

Substitute $b = 1$ in (1)

$$-2a + 7(1) = 5$$

$$-2a = 5 - 7$$

$$a = \frac{-2}{-2} = 1$$

$$a = \frac{1}{x} = 1$$

$$\Rightarrow x = 1$$

$$\therefore x = 1, y = 1.$$

$$(ii) 6x + 3y = 6xy$$

$$2x + 4y = 5xy$$

$$6x + 3y = 6xy$$

$$2x + 4y = 5xy$$

\div by xy

$$\frac{6x}{xy} + \frac{3y}{xy} = \frac{6xy}{xy}$$

$$\frac{6}{y} + \frac{3}{x} = 6 \dots\dots\dots(1)$$

$$2x + 4y = 5xy$$

\div by xy

$$\frac{2x}{xy} + \frac{4y}{xy} = \frac{5xy}{xy}$$

$$\frac{2}{y} + \frac{4}{x} = 5 \dots\dots\dots(2)$$

substituting $\frac{1}{y} = a$ and $\frac{1}{x} = b$ in eq. (1) and (2)

$$a + 2b = 2 \dots\dots\dots(3)$$

$$4a + 2b = 5 \dots\dots\dots(4)$$

$$-3a = -3$$

$$a = 1$$

Substituting $a = 1$ in (3) we get,

$$1 + 2b = 2$$

$$2b = 1$$

$$b = \frac{1}{2}$$

$$\text{Thus if } a = \frac{1}{x} = 1$$

$$\Rightarrow x = 1.$$

$$\text{Thus if } b = \frac{1}{y} = \frac{1}{2}$$

$$y = 2$$

$$\text{Hence } x = 1, y = 2.$$

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