

Mathematics

Chapter 3 – Pair of Linear Equations in Two Variables

Exercise 3.2

1. Solve the following pair of linear equations by the substitution method

Soln:(i)

By the value of y, we can now find the exact value of x;

$$\therefore x = 14 - y$$

$$\therefore x = 14 - 5$$

$$\text{Or } x = 9$$

Hence, $x = 9$ and $y = 5$.

(ii) Given,

$$s - t = 3$$

$$\frac{s}{3} + \frac{t}{2} = 6$$

are the two equations.

From 1st equation, we get,

$$s = 3 + t \quad \text{.....(1)}$$

Now, substitute the value of s in second equation to get, $(3+t)/3 + (t/2) = 6$

$$\Rightarrow (2(3+t) + 3t)/6 = 6$$

$$\Rightarrow (6+2t+3t)/6 = 6$$

$$\Rightarrow (6+5t) = 36$$

$$\Rightarrow 5t = 30$$

$$\Rightarrow t = 6$$

Now, substitute the value of t in equation (1)

$$s = 3 + 6 = 9$$

Therefore, $s = 9$ and $t = 6$.

(iii) Given,

$3x - y = 3$ and $9x - 3y = 9$ are the two equations.

From 1st equation,

$$\text{we get, } x = (3+y)/3$$

Now, substitute the value of x in the given second equation to get,

$$9(3+y)/3 - 3y = 9$$

$$\Rightarrow 9 + 3y - 3y = 9$$

$$\Rightarrow 9 = 9$$

Therefore, y has infinite values and since,

$$x = (3+y)/3, \text{ so } x \text{ also has infinite values.}$$

(iv) Given,

$0.2x + 0.3y = 1.3$ and $0.4x + 0.5y = 2.3$ are the two equations.

From 1st equation, we get,

$$x = (1.3 - 0.3y)/0.2 \quad \text{.....(1)}$$

Now, substitute the value of x in the given second equation to get,

$$0.4(1.3 - 0.3y)/0.2 + 0.5y = 2.3$$

$$\Rightarrow 2(1.3 - 0.3y) + 0.5y = 2.3$$

$$\Rightarrow 2.6 - 0.6y + 0.5y = 2.3$$

$$\Rightarrow 2.6 - 0.1y = 2.3$$

$$\Rightarrow 0.1y = 0.3$$

$$\Rightarrow y = 3$$

Now, substitute the value of y in equation (1),

we get,

$$x = (1.3 - 0.3(3))/0.2 = (1.3 - 0.9)/0.2 = 0.4/0.2 = 2$$

Therefore, $x = 2$ and $y = 3$.

(v) Given,

$$\sqrt{2}x + \sqrt{3}y = 0 \text{ and } \sqrt{3}x - \sqrt{8}y = 0$$

are the two equations.

From 1st equation, we get,

$$x = -(\sqrt{3}/\sqrt{2})y \quad \text{.....(1)}$$

Putting the value of x in the given second equation to get,

$$\sqrt{3}(-\sqrt{3}/\sqrt{2})y - \sqrt{8}y = 0 \Rightarrow (-3/\sqrt{2})y - \sqrt{8}y = 0$$

$$\Rightarrow y = 0$$

Now, substitute the value of y in equation (1),

we get,

$$x = 0$$

Therefore, $x = 0$ and $y = 0$.

VI) Given,

$(3x/2) - (5y/3) = -2$ and $(x/3) + (y/2) = 13/6$ are the two equations.

From 1st equation, we get,

$$(3/2)x = -2 + (5y/3)$$

$$\Rightarrow x = 2(-6+5y)/9 = (-12+10y)/9 \quad \text{.....(1)}$$

Putting the value of x in the given second equation to get,

$$((-12+10y)/9)/3 + y/2 = 13/6$$

$$\Rightarrow y/2 = 13/6 - ((-12+10y)/27) + y/2 = 13/6$$

$$\frac{-12+10y}{9} + \frac{y}{2} = \frac{13}{6} \Rightarrow \frac{-12+10y}{27} + \frac{y}{2} = \frac{13}{6}$$

$$\Rightarrow \frac{y}{2} = \frac{13}{6} - \frac{-12+10y}{27} \Rightarrow \frac{y}{2} = \frac{117}{54} - \frac{-24+20y}{54}$$

$$\Rightarrow \frac{y}{2} = \frac{117+24-20y}{54}$$

$$\Rightarrow y = 3$$

Now, substitute the value of y in equation (1), we get, $(3x/2) - 5(3)/3 = -2$

$$\Rightarrow (3x/2) - 5 = -2$$

$$\Rightarrow x = 2$$

Therefore, $x = 2$ and $y = 3$.

2. Solve $2x + 3y = 11$ and $2x - 4y = -24$ and hence find the value of 'm' for which $y = mx + 3$.

Soln:

$$2x + 3y = 11 \quad \text{.....(I)}$$

$$2x - 4y = -24 \quad \text{.....(II)}$$

From equation (II), we get

$$x = (11-3y)/2 \quad \text{.....(III)}$$

Substituting the value of x in equation (II), we get

$$2(11-3y)/2 - 4y = 24$$

$$11 - 3y - 4y = -24$$

$$-7y = -35$$

$$y = 5 \quad \text{.....(IV)}$$

Putting the value of y in equation (III), we get

$$x = (11-3 \times 5)/2 = -4/2 = -2$$

$$\text{Hence, } x = -2, y = 5$$

Also,

$$y = mx + 3$$

$$5 = -2m + 3$$

$$-2m = 2$$

$$m = -1$$

Therefore the value of m is -1.

3. Form the pair of linear equations for the following problems and find their solution by substitution method. (Contd...)