Exercise – 3B

1. Solve for x and y:
    x + y = 3, 4x − 3y = 26
    Sol:
    The given system of equation is:
    x + y = 3…….(i)
    4x − 3y = 26 ……(ii)
    On multiplying (i) by 3, we get:

3x + 3y = 9 ….(iii)

On adding (ii) and (iii), we get:

7x = 35

$\Rightarrow$ x = 5

On substituting the value of x = 5 in (i), we get:

5 + y = 3

$\Rightarrow$ y = (3 – 5) = -2

Hence, the solution is x = 5 and y = -2

2. Solve for x and y:

x – y = 3, $\frac{x}{3} + \frac{y}{2} = 6$

Sol:

The given system of equations is

x – y = 3   …..(i)

$\frac{x}{3} + \frac{y}{2} = 6$ ……(ii)

From (i), write y in terms of x to get

y = x – 3

Substituting y = x – 3 in (ii), we get

$\frac{x}{3} + \frac{x-3}{2} = 6$

$\Rightarrow 2x + 3(x – 3) = 36$

$\Rightarrow 2x + 3x – 9 = 36$

$\Rightarrow x = \frac{45}{5} = 9$

Now, substituting x = 9 in (i), we have

9 – y = 3

$\Rightarrow y = 9 – 3 = 6$

Hence, x = 9 and y = 6.

3. Solve for x and y:

2x + 3y = 0, 3x + 4y = 5

Sol:

The given system of equation is:

2x + 3y = 0   ……(i)

3x + 4y = 5 ……(ii)

On multiplying (i) by 4 and (ii) by 3, we get:

8x + 12y = 0   ……(iii)

9x + 12y = 15 …….(iv)

On subtracting (iii) from (iv) we get:

x = 15

On substituting the value of x = 15 in (i), we get:

30 + 3y = 0

$\Rightarrow 3y = -30$

$\Rightarrow y = -10$

Hence, the solution is x = 15 and y = -10.

4.   Solve for x and y:

2x - 3y = 13, 7x - 2y = 20

Sol:

The given system of equation is:

2x - 3y = 13   ……(i)

7x - 2y = 20 ……(ii)

On multiplying (i) by 2 and (ii) by 3, we get:

4x - 6y = 26   ……(iii)

21x - 6y = 60 …….(iv)

On subtracting (iii) from (iv) we get:

17x = (60 – 26) = 34

$\Rightarrow x = 2$

On substituting the value of x = 2 in (i), we get:

4 – 3y = 13

$\Rightarrow 3y = (4 – 13) = -9$

$\Rightarrow y = -3$

Hence, the solution is x = 2 and y = -3.

5.   Solve for x and y:

3x - 5y - 19 = 0, -7x + 3y + 1 = 0

Sol:

The given system of equation is:

3x - 5y - 19 = 0   ……(i)

-7x + 3y + 1 = 0 ……(ii)

On multiplying (i) by 3 and (ii) by 5, we get:

9x - 15y = 57   ……(iii)

-35x + 15y = -5 …….(iv)

On subtracting (iii) from (iv) we get:

-26x = (57 – 5) = 52

$\Rightarrow x = -2$

On substituting the value of x = -2 in (i), we get:

–6 – 5y – 19 = 0

$\Rightarrow 5y = (-6 - 19) = -25$

$\Rightarrow y = -5$

Hence, the solution is x = -2 and y = -5.

6. Solve for x and y:
    2x – y + 3 = 0, 3x – 7y + 10 = 0
    Sol:
    The given system of equation is:
    2x – y + 3 = 0…….(i)
    3x – 7y + 10 = 0 ……(ii)
    From (i), write y in terms of x to get
    y=2x + 3
    Substituting y = 2x + 3 in (ii), we get
    3x – 7(2x + 3) + 10 = 0
    $\Rightarrow 3x - 14x - 21 + 10 = 0$
    $\Rightarrow -7x = 21 - 10 = 11$
    $x = -\frac{11}{7}$
    Now substituting $x = -\frac{11}{7}$ in (i), we have
    $-\frac{22}{7} - y + 3 = 0$
    $y = 3 - \frac{22}{7} = -\frac{1}{7}$
    Hence, $x = -\frac{11}{7}$ and $y = -\frac{1}{7}$.

7. Solve for x and y:
    9x - 2y = 108, 3x + 7y = 105
    Sol:
    The given system of equation can be written as:
    9x - 2y = 108   ……(i)
    3x + 7y = 105 ……(ii)
    On multiplying (i) by 7 and (ii) by 2, we get:

    63x + 6x = 108 × 7 + 105 × 2

    $\Rightarrow 69x = 966$

    $\Rightarrow x = \frac{966}{69} = 14$

    Now, substituting x = 14 in (i), we get:

    9 × 14 – 2y = 108

    $\Rightarrow 2y = 126 - 108$

$\Rightarrow y = \frac{18}{2} = 9$

Hence, x = 14 and y = 9.

8. Solve for x and y:

$\frac{x}{3} + \frac{y}{4} = 11, \frac{5x}{6} - \frac{y}{3} + 7 = 0$

Sol:

The given equations are:

$\frac{x}{3} + \frac{y}{4} = 11$

$\Rightarrow 4x + 3y = 132$ …….(i)

and $\frac{5x}{6} - \frac{y}{3} + 7 = 0$

$\Rightarrow 5x - 2y = -42$ ……..(ii)

On multiplying (i) by 2 and (ii) by 3, we get:

8x + 6y = 264 …...(iii)

15x – 6y = -126 ….(iv)

On adding (iii) and (iv), we get:

23x = 138

$\Rightarrow x = 6$

On substituting x = 6 in (i), we get:

24 + 3y = 132

$\Rightarrow 3y = (132 - 24) = 108$

$\Rightarrow y = 36$

Hence, the solution is x = 6 and y = 36.

9. Solve for x and y:

$4x - 3y = 8, 6x - y = \frac{29}{3}$

Sol:

The given system of equation is:

4x - 3y = 8   ……(i)

$6x - y = \frac{29}{3}$ ……(ii)

On multiplying (ii) by 3, we get:

18x – 3y = 29 ….(iii)

On subtracting (iii) from (i) we get:

-14x = -21

$x = \frac{21}{14} = \frac{3}{2}$

Now, substituting the value of $x = \frac{3}{2}$ in (i), we get:

$4 \times \frac{3}{2} - 3y = 8$

$\Rightarrow 6 - 3y = 8$

$\Rightarrow 3y = 6 - 8 = -2$

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

Hence, the solution $x = \frac{3}{2}$ and $y = \frac{-2}{3}$.

10. Solve for x and y:

$2x - \frac{3y}{4} = 3, 5x = 2y + 7$

Sol:

The given equations are:

$2x - \frac{3y}{4} = 3$ …..(i)

$5x = 2y + 7$ ……..(ii)

On multiplying (i) by 2 and (ii) by $\frac{3}{4}$, we get:

$4x - \frac{3}{2}y = 6$ …...(iii)

$\frac{15}{4}x = \frac{3}{2}y + \frac{21}{4}$ ….(iv)

On subtracting (iii) and (iv), we get:

$-\frac{1}{4}x = -\frac{3}{4}$

$\Rightarrow x = 3$

On substituting x = 3 in (i), we get:

$2 \times 3 - \frac{3y}{4} = 3$

$\Rightarrow \frac{3y}{4} = (6 - 3) = 3$

$\Rightarrow y = \frac{3 \times 4}{3} = 4$

Hence, the solution is x = 3 and y = 4.

11. Solve for x and y:

$2x + 5y = \frac{8}{3}, 3x - 2y = \frac{5}{6}$

Sol:

The given equations are:

$2x - 5y = \frac{8}{3}$ …..(i)

$3x - 2y = \frac{5}{6}$ ……..(ii)

On multiplying (i) by 2 and (ii) by 5, we get:

$4x - 10y = \frac{16}{3}$ …...(iii)

$15x - 10y = \dfrac{25}{6}$......(iv)

On adding (iii) and (iv), we get:

$19x = \dfrac{57}{6}$

$\Rightarrow x = \dfrac{57}{6 \times 19} = \dfrac{3}{6} = \dfrac{1}{2}$

On substituting $x = \dfrac{1}{2}$ in (i), we get:

$2 \times \dfrac{1}{2} + 5y = \dfrac{8}{3}$

$\Rightarrow 5y = \left(\dfrac{8}{3} - 1\right) = \dfrac{5}{3}$

$\Rightarrow y = \dfrac{5}{3 \times 5} = \dfrac{1}{3}$

Hence, the solution is $x = \dfrac{1}{2}$ and $y = \dfrac{1}{3}$.

12. Solve for x and y:

$2x + 3y + 1 = 0$

$\dfrac{7 - 4x}{3} = y$

Sol:

The given equations are:

$\dfrac{7 - 4x}{3} = y$

$\Rightarrow 4x + 3y = 7$ ……..(i)

and $2x + 3y + 1 = 0$

$\Rightarrow 2x + 3y = -1$ ……….(ii)

On subtracting (ii) from (i), we get:

$2x = 8$

$\Rightarrow x = 4$

On substituting $x = 4$ in (i), we get:

$16x + 3y = 7$

$\Rightarrow 3y = (7 - 16) = -9$

$\Rightarrow y = -3$

Hence, the solution is $x = 4$ and $y = -3$.

13. Solve for x and y:

$0.4x + 0.3y = 1.7,\ 0.7x - 0.2y = 0.8.$

Sol:

The given system of equations is

$0.4x + 0.3y = 1.7$ …….(i)

$0.7x - 0.2y = 0.8$ …….(ii)

Multiplying (i) by 0.2 and (ii) by 0.3 and adding them, we get

$0.8x + 2.1x = 3.4 + 2.4$

$\Rightarrow 2.9x = 5.8$

$\Rightarrow x = \frac{5.8}{2.9} = 2$

Now, substituting x = 2 in (i), we have

$0.4 \times 2 + 0.3y = 1.7$

$\Rightarrow 0.3y = 1.7 - 0.8$

$\Rightarrow y = \frac{0.9}{0.3} = 3$

Hence, x = 2 and y = 3.

14.   Solve for x and y:
       $0.3x + 0.5y = 0.5$, $0.5x + 0.7y = 0.74$
       Sol:
       The given system of equations is
       $0.3x + 0.5y = 0.5$ …….(i)
       $0.5x + 0.7y = 0.74$ …….(ii)
       Multiplying (i) by 5 and (ii) by 3 and subtracting (ii) from (i), we get
       2.5y - 2.1y = 2.5 - 2.2

       $\Rightarrow 0.4y = 0.28$

       $\Rightarrow y = \frac{0.28}{0.4} = 0.7$

       Now, substituting y = 0.7 in (i), we have

       $0.3x + 0.5 \times 0.7 = 0.5$

       $\Rightarrow 0.3x = 0.50 - 0.35 = 0.15$

       $\Rightarrow x = \frac{0.15}{0.3} = 0.5$

       Hence, x = 0.5 and y = 0.7.

15.   Solve for x and y:
       $7(y + 3) - 2(x + 2) = 14$, $4(y - 2) + 3(x - 3) = 2$
       Sol:
       The given equations are:
       $7(y + 3) - 2(x + 2) = 14$

       $\Rightarrow 7y + 21 - 2x - 4 = 14$

       $\Rightarrow -2x + 7y = -3$ ……..(i)
       and $4(y - 2) + 3(x - 3) = 2$

       $\Rightarrow 4y - 8 + 3x - 9 = 2$

$\Rightarrow 3x + 4y = 19$ ………(ii)
On multiplying (i) by 4 and (ii) by 7, we get:
-8x + 28y = -12   ……(iii)
21x + 28y = 133   ……(iv)
On subtracting (iii) from (iv), we get:
29x = 145

$\Rightarrow x = 5$
On substituting x = 5 in (i), we get:
-10 + 7y = -3

$\Rightarrow 7y = (-3 + 10) = 7$

$\Rightarrow y = 1$
Hence, the solution is x = 5 and y = 1.

16. Solve for x and y:
6x + 5y = 7x + 3y + 1 = 2(x + 6y − 1)
Sol:
The given equations are:
6x + 5y = 7x + 3y + 1 = 2(x + 6y − 1)

$\Rightarrow 6x + 5y = 2(x + 6y − 1)$

$\Rightarrow 6x + 5y = 2x + 12y − 2$

$\Rightarrow 6x − 2x + 5y − 12y = -2$

$\Rightarrow 4x − 7y = -2$ …….(i)
and 7x + 3y + 1 = 2(x + 6y − 1)

$\Rightarrow 7x + 3y + 1 = 2x + 12y − 2$

$\Rightarrow 7x − 2x + 3y − 12y = -2 − 1$

$\Rightarrow 5x − 9y = -3$ …….(ii)
On multiplying (i) by 9 and (ii) by 7, we get:
36x - 63y = -18   ……(iii)
35x - 63y = -21   ……(iv)
On subtracting (iv) from (iii), we get:
x = (-18 + 21) = 3
On substituting x = 3 in (i), we get:
12 - 7y = -2

$\Rightarrow 7y = (2 + 12) = 14$

$\Rightarrow y = 2$
Hence, the solution is x = 3 and y = 2.

17. Solve for x and y:

$$\frac{x+y-8}{2} = \frac{x+2y-14}{3} = \frac{3x+y-12}{11}$$

Sol:

The given equations are:

$$\frac{x+y-8}{2} = \frac{x+2y-14}{3} = \frac{3x+y-12}{11}$$

i.e., $\frac{x+y-8}{2} = \frac{3x+y-12}{11}$

By cross multiplication, we get:

11x + 11y − 88 = 6x + 2y − 24

⇒11x − 6x + 11y − 2y = -24 + 88

⇒5x + 9y = 64   …….(i)

and $\frac{x+2y-14}{3} = \frac{3x+y-12}{11}$

⇒11x + 22y − 154 = 9x + 3y − 36

⇒11x − 9x + 22y − 3y = -36 + 154

⇒2x + 19y = 118   …….(ii)

On multiplying (i) by 19 and (ii) by 9, we get:

95x + 171y = 1216   ……(iii)

18x + 171y = 1062   ……(iv)

On subtracting (iv) from (iii), we get:

77x = 154

⇒x = 2

On substituting x = 2 in (i), we get:

10 + 9y = 64

⇒9y = (64 − 10) = 54

⇒y = 6

Hence, the solution is x = 2 and y = 6.

18. Solve for x and y:

$$\frac{5}{x} + 6y = 13, \frac{3}{x} + 4y = 7$$

Sol:

The given equations are:

$\frac{5}{x} + 6y = 13$ ……..(i)

$\frac{3}{x} + 4y = 7$ ……..(ii)

Putting $\frac{1}{x} = u$, we get:

5u + 6y = 13 …….(iii)

3u + 4y = 7 ……(iv)

On multiplying (iii) by 4 and (iv) by 6, we get:

20u + 24y = 52 ……..(v)

18u + 24y = 42 ……..(vi)

On subtracting (vi) from (v), we get:

2u = 10 ⇒ u = 5

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

On substituting $x = \frac{1}{5}$ in (i), we get:

$\frac{5}{1/_3} + 6y = 13$

25 + 6y = 13

6y = (13 − 25) = -12

y = -2

Hence, the required solution is $x = \frac{1}{5}$ and y = -2.

19. Solve for x and y:

$x + \frac{6}{y} = 6, 3x - \frac{8}{y} = 5$

Sol:

The given equations are:

$x + \frac{6}{y} = 6$ ……..(i)

$3x - \frac{8}{y} = 5$ ……..(ii)

Putting $\frac{1}{y} = v$, we get:

x + 6v = 6 …….(iii)

3x − 8v = 5 ……(iv)

On multiplying (iii) by 4 and (iv) by 3, we get:

4x + 24v = 24 ……..(v)

9x − 24v = 15 ……..(vi)

On adding (v) from (vi), we get:

13x = 39 ⇒ x = 3

On substituting x = 3 in (i), we get:

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

$\Rightarrow \frac{6}{y} = (6 − 3) = 3 \Rightarrow 3y = 6 \Rightarrow y = 2$

Hence, the required solution is x = 3 and y = 2.

20. Solve for x and y:

$2x - \dfrac{3}{y} = 9, 3x + \dfrac{7}{y} = 2$

Sol:

The given equations are:

$2x - \dfrac{3}{y} = 9$ ……..(i)

$3x + \dfrac{7}{y} = 2$ ……..(ii)

Putting $\dfrac{1}{y} = v$, we get:

$2x - 3v = 6$ …….(iii)

$3x + 7v = 2$ ……(iv)

On multiplying (iii) by 7 and (iv) by 3, we get:

$14x - 21v = 63$ ……..(v)

$9x + 21v = 6$ ……..(vi)

On adding (v) from (vi), we get:

$23x = 69 \Rightarrow x = 3$

On substituting $x = 3$ in (i), we get:

$2 \times 3 - \dfrac{3}{y} = 9$

$\Rightarrow 6 - \dfrac{3}{y} = 9 \Rightarrow \dfrac{3}{y} = -3 \Rightarrow y = -1$

Hence, the required solution is $x = 3$ and $y = -1$.

21. Solve for x and y:

$\dfrac{3}{x} - \dfrac{1}{y} + 9 = 0, \dfrac{2}{x} + \dfrac{3}{y} = 5$

Sol:

The given equations are:

$\dfrac{3}{x} - \dfrac{1}{y} + 9 = 0,$

$\Rightarrow \dfrac{3}{x} - \dfrac{1}{y} = -9$ ……..(i)

$\Rightarrow \dfrac{2}{x} - \dfrac{3}{y} = 5$……..(ii)

Putting $\dfrac{1}{x} = u$ and $\dfrac{1}{y} = v$, we get:

$3u - v = -9$ …….(iii)

$2u + 3v = 5$ ……(iv)

On multiplying (iii) by 3, we get:

$9u - 3v = -27$ ……..(v)

On adding (iv) and (v), we get:

$11u = -22 \Rightarrow u = -2$

$\Rightarrow \dfrac{1}{x} = -2 \Rightarrow x = \dfrac{-1}{2}$

On substituting $x = \dfrac{-1}{2}$ in (i), we get:

$\frac{3}{-1/2} - \frac{1}{y} = -9$

$\Rightarrow -6 - \frac{1}{y} = -9 \Rightarrow \frac{1}{y} = (-6 + 9) = 3$

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

Hence, the required solution is $x = \frac{-1}{2}$ and $y = \frac{1}{3}$.

22. Solve for x and y:

$\frac{9}{x} - \frac{4}{y} = 8, \frac{13}{x} + \frac{7}{y} = 101$

Sol:

The given equations are:

$\frac{9}{x} - \frac{4}{y} = 8$ ....(i)

$\frac{13}{x} + \frac{7}{y} = 101$ ....(ii)

Putting $\frac{1}{x} = u$ and $\frac{1}{y} = v$, we get:

$9u - 4v = 8$ ....(iii)

$13u + 7v = 101$ ......(iv)

On multiplying (iii) by 7 and (iv) by 4, we get:

$63u - 28v = 56$ ....(v)

$52u + 28v = 404$ ....(vi)

On adding (v) from (vi), we get:

$115u = 460 \Rightarrow u = 4$

$\Rightarrow \frac{1}{x} = 4 \Rightarrow x = \frac{1}{4}$

On substituting $x = \frac{1}{4}$ in (i), we get:

$\frac{9}{1/4} - \frac{4}{y} = 8$

$\Rightarrow 36 - \frac{4}{y} = 8 \Rightarrow \frac{4}{y} = (36 - 8) = 28$

$y = \frac{4}{28} = \frac{1}{7}$

Hence, the required solution is $x = \frac{1}{4}$ and $y = \frac{1}{7}$.

23. Solve for x and y:

$\frac{5}{x} - \frac{3}{y} = 1, \frac{3}{2x} + \frac{2}{3y} = 5$

Sol:

The given equations are:

$\frac{5}{x} - \frac{3}{y} = 1$ ....(i)

$\frac{3}{2x} + \frac{2}{3y} = 5$ ....(ii)

Putting $\frac{1}{x} = u$ and $\frac{1}{y} = v$, we get:

$5u - 3v = 1$ …….(iii)

$\Rightarrow \frac{3}{2}u + \frac{2}{3}v = 5$

$\Rightarrow \frac{9u+4v}{6} = 5$

$\Rightarrow 9u + 4v = 30$ …….(iv)

On multiplying (iii) by 4 and (iv) by 3, we get:

$20u - 12v = 4$ ……..(v)

$27u + 12v = 90$ ……..(vi)

On adding (iv) and (v), we get:

$47u = 94 \Rightarrow u = 2$

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

On substituting $x = \frac{1}{2}$ in (i), we get:

$\frac{5}{1/2} - \frac{3}{y} = 1$

$\Rightarrow 10 - \frac{3}{y} = 1 \Rightarrow \frac{3}{y} = (10 - 1) = 9$

$y = \frac{3}{9} = \frac{1}{3}$

Hence, the required solution is $x = \frac{1}{2}$ and $y = \frac{1}{3}$.

24. Solve for x and y:

$\frac{3}{x} + \frac{2}{y} = 12, \frac{2}{x} + \frac{3}{y} = 13$

Sol:

The given equations are:

$\frac{3}{x} + \frac{2}{y} = 12$ ……..(i)

$\frac{2}{x} + \frac{3}{y} = 13$ ……..(ii)

Multiplying (i) by 3 and (ii) by 2 and subtracting (ii) from (i), we get:

$\frac{9}{x} - \frac{4}{x} = 36 - 26$

$\Rightarrow \frac{5}{x} = 10$

$\Rightarrow x = \frac{5}{10} = \frac{1}{2}$

Now, substituting $x = \frac{1}{2}$ in (i), we have

$6 + \frac{2}{y} = 12$

$\Rightarrow \frac{2}{y} = 6$

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

Hence, $x = \frac{1}{2}$ and $y = \frac{1}{3}$.

25. Solve for x and y:

$4x + 6y = 3xy$, $8x + 9y = 5xy$

Sol:

The given equations are:

$4x + 6y = 3xy$ …..(i)

$8x + 9y = 5xy$ ……(ii)

From equation (i), we have:

$\frac{4x + 6y}{xy} = 3$

$\Rightarrow \frac{4}{y} + \frac{6}{x} = 3$ ……(iii)

For equation (ii), we have:

$\frac{8x + 9y}{xy} = 5$

$\Rightarrow \frac{8}{y} + \frac{9}{x} = 5$ ……(iv)

On substituting $\frac{1}{y} = v$ and $\frac{1}{x} = u$, we get:

$4v + 6u = 3$ ……(v)

$8v + 9u = 5$ …….(vi)

On multiplying (v) by 9 and (vi) by 6, we get:

$36v + 54u = 27$ ….(vii)

$48v + 54u = 30$ ….(viii)

On subtracting (vii) from (viii), we get:

$12v = 3 \Rightarrow v = \frac{3}{12} = \frac{1}{4}$

$\Rightarrow \frac{1}{y} = \frac{1}{4} \Rightarrow y = 4$

On substituting y =4 in (iii), we get:

$\frac{4}{4} + \frac{6}{x} = 3$

$\Rightarrow 1 + \frac{6}{x} = 3 \Rightarrow \frac{6}{x} = (3 - 1) = 2$

$\Rightarrow 2x = 6 \Rightarrow x = \frac{6}{2} = 3$

Hence, the required solution is x = 3 and y = 4.

26. Solve for x and y:

$x + y = 5xy$, $3x + 2y = 13xy$

Sol:

The given equations are:

$x + y = 5xy$ …..(i)

$3x + 2y = 13xy$ ……(ii)

From equation (i), we have:

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

$\Rightarrow \frac{1}{y} + \frac{1}{x} = 5$ ......(iii)

For equation (ii), we have:

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

$\Rightarrow \frac{3}{y} + \frac{2}{x} = 13$ ......(iv)

On substituting $\frac{1}{y}$ = v and $\frac{1}{x}$ = u, we get:

v + u = 5 ......(v)

3v + 2u = 13 ....(vi)

On multiplying (v) by 2, we get:

2v + 2u = 10 ....(vii)

On subtracting (vii) from (vi), we get:

v = 3

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

On substituting $y = \frac{1}{3}$ in (iii), we get:

$\frac{1}{1/3} + \frac{1}{x} = 5$

$\Rightarrow 3 + \frac{1}{x} = 5 \Rightarrow \frac{1}{x} = 2 \Rightarrow x = \frac{1}{2}$

Hence, the required solution is $x = \frac{1}{2}$ and $y = \frac{1}{3}$ or x= 0 and y = 0.

27.   Solve for x and y:

$\frac{5}{x+y} - \frac{2}{x-y} = -1, \frac{15}{x+y} - \frac{7}{x-y} = 10$

Sol:

The given equations are

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

$\frac{15}{x+y} - \frac{7}{x-y} = 10$ ......(ii)

Substituting $\frac{1}{x+y}$ = u and $\frac{1}{x-y}$ = v in (i) and (ii), we get

5u – 2v = -1   ....(iii)

15u + 7v = 10   ....(iv)

Multiplying (iii) by 3 and subtracting it from (iv), we get

7v + 6v = 10 + 3

$\Rightarrow 13v = 13$

$\Rightarrow v = 1$

$\Rightarrow x - y = 1 \qquad \left(\because \frac{1}{x-y} = v \right) \qquad \dots\dots(v)$

Now, substituting v = 1 in (iii), we get

5u – 2 = -1

$\Rightarrow 5u = 1$

$\Rightarrow u = \frac{1}{5}$

x + y = 5 $\qquad\qquad\qquad\qquad$ ……..(vi)

Adding (v) and (vi), we get

$2x = 6 \Rightarrow x = 3$

Substituting x = 3 in (vi), we have

$3 + y = 5 \Rightarrow y = 5 - 3 = 2$

Hence, x = 3 and y = 2.

28. Solve for x and y:

$\frac{3}{x+y} + \frac{2}{x-y} = 2, \frac{3}{x+y} + \frac{2}{x-y} = 2$

Sol:

The given equations are

$\frac{3}{x+y} + \frac{2}{x-y} = 2 \qquad \dots\dots(i)$

$\frac{9}{x+y} - \frac{4}{x-y} = 1 \qquad \dots\dots(ii)$

Substituting $\frac{1}{x+y}$ = u and $\frac{1}{x-y}$ = v, we get:

3u + 2v = 2 $\qquad$ ……..(iii)

9u - 4v = 1 $\qquad$ …….(iv)

On multiplying (iii) by 2, we get:

6u + 4v = 4 $\qquad$ …..(v)

On adding (iv) and (v), we get:

15u = 5

$\Rightarrow u = \frac{5}{15} = \frac{1}{3}$

$\Rightarrow \frac{1}{x+y} = \frac{1}{3} \Rightarrow x + y = 3 \qquad$ …….(vi)

On substituting u = $\frac{1}{3}$ in (iii), we get

1 + 2v = 2

$\Rightarrow 2v = 1$

$\Rightarrow v = \frac{1}{2}$

$\Rightarrow \frac{1}{x-y} = \frac{1}{2} \Rightarrow x - y = 2 \qquad$ …….(vii)

On adding (vi) and (vii), we get

2x = 5

$\Rightarrow x = \frac{5}{2}$

On substituting $x = \frac{5}{2}$ in (vi), we have

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

$\Rightarrow y = \left(3 - \frac{5}{2}\right) = \frac{1}{2}$

Hence, the required solution is $x = \frac{5}{2}$ and $y = \frac{1}{2}$.

29. Solve for x and y:

$\frac{5}{x+1} + \frac{2}{y-1} = \frac{1}{2}, \frac{10}{x+1} - \frac{2}{y-1} = \frac{5}{2}$, where $x \neq 1$, $y \neq 1$.

Sol:

The given equations are

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

$\frac{10}{x+1} - \frac{2}{y-1} = \frac{5}{2}$ ......(ii)

Substituting $\frac{1}{x+1} = u$ and $\frac{1}{y-1} = v$, we get:

$5u - 2v = \frac{1}{2}$ ....(iii)

$10u + 2v = \frac{5}{2}$ ....(iv)

On adding (iii) and (iv), we get:

$15u = 3$

$\Rightarrow u = \frac{3}{15} = \frac{1}{5}$

$\Rightarrow \frac{1}{x+1} = \frac{1}{5} \Rightarrow x + 1 = 5 \Rightarrow x = 4$

On substituting $u = \frac{1}{5}$ in (iii), we get

$5 \times \frac{1}{5} - 2v = \frac{1}{2} \Rightarrow 1 - 2v = \frac{1}{2}$

$\Rightarrow 2v = \frac{1}{2} \Rightarrow v = \frac{1}{4}$

$\Rightarrow \frac{1}{y-1} = \frac{1}{4} \Rightarrow y - 1 = 4 \Rightarrow y = 5$

Hence, the required solution is $x = 4$ and $y = 5$.

30. Solve for x and y:

$\frac{44}{x+y} + \frac{30}{x-y} = 10, \frac{55}{x+y} - \frac{40}{x-y} = 13$.

Sol:

The given equations are

$\frac{44}{x+y} + \frac{30}{x-y} = 10$ ......(i)

$\frac{55}{x+y} - \frac{40}{x-y} = 13$ ......(ii)

Putting $\frac{1}{x+y}$ = u and $\frac{1}{x-y}$ = v, we get:

44u + 30v = 10   ……..(iii)

55u + 40v = 13   …….(iv)

On multiplying (iii) by 4 and (iv) by 3, we get:

176u + 120v = 40   …..(v)

165u + 120v = 39   …..(vi)

On subtracting (vi) and (v), we get:

11u = 1

$\Rightarrow$ u = $\frac{1}{11}$

$\Rightarrow \frac{1}{x+y} = \frac{1}{11} \Rightarrow$ x + y = 11   …….(vii)

On substituting u = $\frac{1}{11}$ in (iii), we get:

4 + 30v = 10

$\Rightarrow$ 30v = 6

$\Rightarrow$ v = $\frac{6}{30} = \frac{1}{5}$

$\Rightarrow \frac{1}{x-y} = \frac{1}{5} \Rightarrow$ x – y = 5   …….(viii)

On adding (vii) and (viii), we get

2x = 16

$\Rightarrow$ x = 8

On substituting x =8 in (vii), we get:

8 + y = 11

$\Rightarrow$ y = 11 – 8 = 3

Hence, the required solution is x = 8 and y =3.

31. Solve for x and y:

$\frac{10}{x+y} + \frac{2}{x-y}$ = 4, $\frac{15}{x+y} - \frac{9}{x-y}$ = -2, where x $\neq$ y, x $\neq$ -y.

Sol:

The given equations are

$\frac{10}{x+y} + \frac{2}{x-y}$ = 4   ……(i)

$\frac{15}{x+y} - \frac{9}{x-y}$ = -2   ……(ii)

Substituting $\frac{1}{x+y}$ = u and $\frac{1}{x-y}$ = v in (i) and (ii), we get:

10u + 2v = 4   ……..(iii)

15u - 9v = -2   …….(iv)

Multiplying (iii) by 9 and (iv) by 2 and adding, we get:

90u + 30u = 36 – 4

$\Rightarrow 120u = 32$

$\Rightarrow u = \frac{32}{120} = \frac{4}{15}$

$\Rightarrow x + y = \frac{15}{4}$ $\left(\because \frac{1}{x+y} = u \right)$ …..(v)

On substituting $u = \frac{4}{15}$ in (iii), we get:

$10 \times \frac{4}{15} + 2v = 4$

$\frac{8}{3} + 2v = 4$

$\Rightarrow 2v = 4 - \frac{8}{3} = \frac{4}{3}$

$\Rightarrow v = \frac{2}{3}$

$\Rightarrow x - y = \frac{3}{2}$ $\left(\because \frac{1}{x-y} = v \right)$ …..(vi)

Adding (v) and (vi), we get

$2x = \frac{15}{4} + \frac{3}{2} \Rightarrow 2x = \frac{21}{4} \Rightarrow x = \frac{21}{8}$

Substituting $x = \frac{21}{8}$ in (v), we have

$\frac{21}{8} + y = \frac{15}{4} \Rightarrow y = \frac{15}{4} - \frac{21}{8} = \frac{9}{8}$

Hence, $x = \frac{21}{8}$ and $y = \frac{9}{8}$.

32. Solve for x and y:
     71x + 37y = 253, 37x + 71y = 287
     Sol:
     The given equations are:
     71x + 37y = 253 …..(i)
     37x + 71y = 287 ……(ii)
     On adding (i) and (ii), we get:
     108x + 108y = 540

     $\Rightarrow 108(x + y) = 540$

     $\Rightarrow (x + y) = 5$ ……(iii)
     On subtracting (ii) from (i), we get:
     34x − 34y = -34

     $\Rightarrow 34(x − y) = -34$

     $\Rightarrow (x − y) = -1$ ……(iv)
     On adding (iii) from (i), we get:
     2x = 5 − 1 = 4

     $\Rightarrow x = 2$
     On subtracting (iv) from (iii), we get:

$2y = 5 + 1 = 6$

$\Rightarrow y = 3$

Hence, the required solution is $x = 2$ and $y = 3$.

33. Solve for x and y:

$217x + 131y = 913,\ 131x + 217y = 827$

Sol:

The given equations are:

$217x + 131y = 913$ …..(i)

$131x + 217y = 827$ ……(ii)

On adding (i) and (ii), we get:

$348x + 348y = 1740$

$\Rightarrow 348(x + y) = 1740$

$\Rightarrow x + y = 5$ ……(iii)

On subtracting (ii) from (i), we get:

$86x - 86y = 86$

$\Rightarrow 86(x - y) = 86$

$\Rightarrow x - y = 1$ ……(iv)

On adding (iii) from (i), we get:

$2x = 6$

$\Rightarrow x = 3$

On substituting $x = 3$ in (iii), we get:

$3 + y = 5$

$\Rightarrow y = 5 - 3 = 2$

Hence, the required solution is $x = 3$ and $y = 2$.

34. Solve for x and y:

$23x - 29y = 98,\ 29x - 23y = 110$

Sol:

The given equations are:

$23x - 29y = 98$ …..(i)

$29x - 23y = 110$ ……(ii)

Adding (i) and (ii), we get:

$52x - 52y = 208$

$\Rightarrow x - y = 4$ ……(iii)

Subtracting (i) from (ii), we get:

$6x + 6y = 12$

$\Rightarrow x + y = 2$ ……(iv)

Now, adding equation (iii) and (iv), we get:

$2x = 6$

$\Rightarrow x = 3$

On substituting x = 3 in (iv), we have:

$3 + y = 2$

$\Rightarrow y = 2 - 3 = -1$

Hence, x = 3 and y = -1.

35. Solve for x and y:

$\frac{5}{x} + \frac{2}{y} = 6, \frac{-5}{x} + \frac{4}{y} = -3$

Sol:

The given equations can be written as

$\frac{5}{x} + \frac{2}{y} = 6$ ……(i)

$\frac{-5}{x} + \frac{4}{y} = -3$ ……(ii)

Adding (i) and (ii), we get

$\frac{6}{y} = 3 \Rightarrow y = 2$

Substituting y = 2 in (i), we have

$\frac{5}{x} + \frac{2}{2} = 6 \Rightarrow x = 1$

Hence, x = 1 and y = 2.

36. Solve for x and y:

$\frac{1}{3x+y} + \frac{1}{3x-y} = \frac{3}{4}, \frac{1}{2(3x+y)} - \frac{1}{2(3x-y)} = -\frac{1}{8}$

Sol:

The given equations are

$\frac{1}{3x+y} + \frac{1}{3x-y} = \frac{3}{4}$ ……(i)

$\frac{1}{2(3x+y)} - \frac{1}{2(3x-y)} = -\frac{1}{8}$

$\frac{1}{3x+y} - \frac{1}{3x-y} = -\frac{1}{4}$ (Multiplying by 2)   ……(ii)

Substituting $\frac{1}{3x+y} = u$ and $\frac{1}{3x-y} = v$ in (i) and (ii), we get:

$u + v = \frac{3}{4}$ ……..(iii)

$u - v = -\frac{1}{4}$ …….(iv)

Adding (iii) and (iv), we get:

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

$\Rightarrow u = \dfrac{1}{4}$

$\Rightarrow 3x + y = 4$ $\left(\because \dfrac{1}{3x+y} = u \right)$ …..(v)

Now, substituting $u = \dfrac{1}{4}$ in (iii), we get:

$\dfrac{1}{4} + v = \dfrac{3}{4}$

$v = \dfrac{3}{4} - \dfrac{1}{4}$

$\Rightarrow v = \dfrac{1}{2}$

$\Rightarrow 3x - y = 2$ $\left(\because \dfrac{1}{3x-y} = v \right)$ …..(vi)

Adding (v) and (vi), we get

$6x = 6 \Rightarrow x = 1$

Substituting $x = 1$ in (v), we have

$3 + y = 4 \Rightarrow y = 1$

Hence, $x = 1$ and $y = 1$.

37. Solve for x and y:

$\dfrac{1}{2(x+2y)} + \dfrac{5}{3(3x-2y)} = -\dfrac{3}{2}, \dfrac{1}{4(x+2y)} - \dfrac{3}{5(3x-2y)} = \dfrac{61}{60}$ where $x + 2y \neq 0$ and $3x - 2y \neq 0$.

Sol:

The given equations are

$\dfrac{1}{2(x+2y)} + \dfrac{5}{3(3x-2y)} = -\dfrac{3}{2}$ ……(i)

$\dfrac{1}{4(x+2y)} - \dfrac{3}{5(3x-2y)} = \dfrac{61}{60}$ ……(ii)

Putting $\dfrac{1}{x+2y} = u$ and $\dfrac{1}{3x-2y} = v$, we get:

$\dfrac{1}{2}u + \dfrac{5}{3}v = -\dfrac{3}{2}$ ……..(iii)

$\dfrac{5}{4}u - \dfrac{3}{5}v = \dfrac{61}{60}$ …….(iv)

On multiplying (iii) by 6 and (iv) by 20, we get:

$3u + 10v = -9$ …..(v)

$25u - 12v = \dfrac{61}{3}$ …..(vi)

On multiplying (v) by 6 and (vi) by 5, we get

$18u + 60v = -54$ …….(vii)

$125u - 60v = \dfrac{305}{3}$ ……..(viii)

On adding(vii) and (viii), we get:

$143u = \dfrac{305}{3} - 54 = \dfrac{305-162}{3} = \dfrac{143}{3}$

$\Rightarrow u = \dfrac{1}{3} = \dfrac{1}{x+2y}$

$\Rightarrow x + 2y = 3$ …….(ix)

On substituting $u = \dfrac{1}{3}$ in (v), we get:

$1 + 10v = -9$

$\Rightarrow 10v = -10$

$\Rightarrow v = -1$

$\Rightarrow \dfrac{1}{3x-2y} = -1 \Rightarrow 3x - 2y = -1$ …….(x)

On adding (ix) and (x), we get:

$4x = 2$

$\Rightarrow x = \dfrac{1}{2}$

On substituting $x = \dfrac{1}{2}$ in (x), we get:

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

$2y = \left(\dfrac{3}{2} + 1\right) = \dfrac{5}{2}$

$y = \dfrac{5}{4}$

Hence, the required solution is $x = \dfrac{1}{2}$ and $y = \dfrac{5}{4}$.

38.   Solve for x and y:

$\dfrac{2}{3x+2y} + \dfrac{3}{3x-2y} = \dfrac{17}{5}, \dfrac{5}{3x+2y} + \dfrac{1}{3x-2y} = 2$

Sol:

The given equations are

$\dfrac{2}{3x+2y} + \dfrac{3}{3x-2y} = \dfrac{17}{5}$ ……(i)

$\dfrac{5}{3x+2y} + \dfrac{1}{3x-2y} = 2$ ……(ii)

Substituting $\dfrac{1}{3x+2y} = u$ and $\dfrac{1}{3x-2y} = v$, in (i) and (ii), we get:

$2u + 3v = \dfrac{17}{5}$ ……..(iii)

$5u + v = 2$ …….(iv)

Multiplying (iv) by 3 and subtracting from (iii), we get:

$2u - 15u = \dfrac{17}{5} - 6$

$\Rightarrow -13u = \dfrac{-13}{5} \Rightarrow u = \dfrac{1}{5}$

$\Rightarrow 3x + 2y = 5 \qquad \left(\because \dfrac{1}{3x+2y} = u\right)$ …..(v)

Now, substituting $u = \dfrac{1}{5}$ in (iv), we get

$1 + v = 2 \Rightarrow v = 1$

$\Rightarrow 3x - 2y = 1 \qquad \left(\because \dfrac{1}{3x-2y} = v\right)$ …….(vi)

Adding(v) and (vi), we get:

$\Rightarrow 6x = 6 \Rightarrow x = 1$

Substituting x = 1 in (v), we get:

$3 + 2y = 5 \Rightarrow y = 1$

Hence, x = 1 and y =1.

39. Solve for x and y:

$\frac{3}{x} + \frac{6}{y} = 7, \frac{9}{x} + \frac{3}{y} = 11$

Sol:

The given equations can be written as

$\frac{3}{x} + \frac{6}{y} = 7$ ....(i)

$\frac{9}{x} + \frac{3}{y} = 11$ ....(ii)

Multiplying (i) by 3 and subtracting (ii) from it, we get

$\frac{18}{y} - \frac{3}{y} = 21 - 11$

$\Rightarrow \frac{15}{y} = 10$

$\Rightarrow y = \frac{15}{10} = \frac{3}{2}$

Substituting $y = \frac{3}{2}$ in (i), we have

$\frac{3}{x} + \frac{6 \times 2}{3} = 7$

$\Rightarrow \frac{3}{x} = 7 - 4 = 3$

Hence, x = 1 and $y = \frac{3}{2}$.

40. Solve for x and y:

$x + y = a + b, ax - by = a^2 - b^2$

Sol:

The given equations are

$x + y = a + b$ ....(i)

$ax - by = a^2 - b^2$ ....(ii)

Multiplying (i) by b and adding it with (ii), we get

$bx + ax = ab + b^2 + a^2 - b^2$

$\Rightarrow x = \frac{ab + a^2}{a + b} = a$

Substituting x = a in (i), we have

$a + y = a + b$

$\Rightarrow y = b$

Hence, x = a and y = b.

41. Solve for x and y:

$\frac{x}{a} + \frac{y}{b} = 2$, $ax - by = (a^2 - b^2)$

Sol:

The given equations are:

$\frac{x}{a} + \frac{y}{b} = 2$

$\Rightarrow \frac{bx + ay}{ab} = 2$ [Taking LCM]

$\Rightarrow bx + ay = 2ab$ …….(i)

Again, $ax - by = (a^2 - b^2)$ …..(ii)

On multiplying (i) by b and (ii) by a, we get:

$b^2x + bay = 2ab^2$ ……..(iii)

$a^2x - bay = a(a^2 - b^2)$ …….(iv)

On adding (iii) from (iv), we get:

$(b^2 + a^2)x = 2a^2b + a(a^2 - b^2)$

$\Rightarrow (b^2 + a^2)x = 2ab^2 + a^3 - ab^2$

$\Rightarrow (b^2 + a^2)x = ab^2 + a^3$

$\Rightarrow (b^2 + a^2)x = a(b^2 + a^2)$

$\Rightarrow x = \frac{a(b^2 + a^2)}{(b^2 + a^2)} = a$

On substituting x = a in (i), we get:

ba + ay = 2ab

$\Rightarrow ay = ab$

$\Rightarrow y = b$

Hence, the solution is x = a and y = b.

42. Solve for x and y:

px + qy = p − q,

qx − py = p + q

Sol:

The given equations are

px + qy = p − q   ………(i)

qx − py = p + q   ………(ii)

Multiplying (i) by p and (ii) by q and adding them , we get

$p^2x + q^2x = p^2 - pq + pq + q^2$

$x = \frac{p^2 + q^2}{p^2 + q^2} = 1$

Substituting x = 1 in (i), we have

p + qy = p − q

$\Rightarrow qy = -p$

$\Rightarrow y = -1$

Hence, x = 1 and y = -1.

43. Solve for x and y:

$\frac{x}{a} - \frac{y}{b} = 0$, ax + by = $a^2 + b^2$

Sol:

The given equations can be written as

$\frac{x}{a} - \frac{y}{b} = 0$ …….(i)

ax + by = $a^2 + b^2$ ……(ii)

From (i),

$y = \frac{bx}{a}$

Substituting y = $\frac{bx}{a}$ in (ii), we get

$ax + \frac{b \times bx}{a} = a^2 + b^2$

$\Rightarrow x = \frac{(a^2 + b^2) \times a}{a^2 + b^2} = a$

Now, substitute x = a in (ii) to get

$a^2 + by = a^2 + b^2$

$\Rightarrow by = b^2$

$\Rightarrow y = b$

Hence, x = a and y = b.

44. Solve for x and y:

6(ax + by) = 3a + 2b,

6(bx – ay) = 3b – 2a

Sol:

The given equations are

6(ax + by) = 3a + 2b

$\Rightarrow$ 6ax + 6by = 3a + 2b   ………(i)

and 6(bx – ay) = 3b – 2a

$\Rightarrow$ 6bx – 6ay = 3b – 2a   ………(ii)

On multiplying (i) by a and (ii) by b, we get

$6a^2x + 6aby = 3a^2 + 2ab$ ……….(iii)

$6b^2x - 6aby = 3b^2 - 2ab$ ……….(iv)

On adding (iii) and (iv), we get

$6(a^2 + b^2)x = 3(a^2 + b^2)$

$x = \frac{3(a^2 + b^2)}{6(a^2 + b^2)} = \frac{1}{2}$

On substituting x = $\frac{1}{2}$ in (i), we get:

6a $\times \frac{1}{2}$ + 6by = 3a + 2b

6by = 2b

y = $\frac{2b}{6b} = \frac{1}{3}$

Hence, the required solution is x = $\frac{1}{2}$ and y = $\frac{1}{3}$.

45. Solve for x and y:

ax - by = a² + b², x + y = 2a

Sol:

The given equations are

ax - by = a² + b²   ………(i)

x + y = 2a   ………(ii)

From (ii)

y = 2a - x

Substituting y = 2a – x in (i), we get

ax – b(2a – x) = a² + b²

$\Rightarrow$ ax – 2ab + bx = a² + b²

$\Rightarrow$ x = $\frac{a^2 + b^2 + 2ab}{a+b} = \frac{(a+b)^2}{a+b}$ = a + b

Now, substitute x = a + b in (ii) to get

a + b + y = 2a

$\Rightarrow$ y = a – b

Hence, x = a + b and y = a – b.

46. Solve for x and y:

$\frac{bx}{a}$ - $\frac{ay}{b}$ + a + b = 0, bx – ay + 2ab = 0

Sol:

The given equations are:

$\frac{bx}{a}$ - $\frac{ay}{b}$ + a + b = 0

By taking LCM, we get:

b²x – a²y = -a²b – b²a   …..(i)

and bx – ay + 2ab = 0

bx – ay = -2ab   …….(ii)

On multiplying (ii) by a, we get:

abx – a²y = -2a²b   ……(iii)

On subtracting (i) from (iii), we get:

abx – b²x = 2a²b + a²b + b²a = -a²b + b²a

$\Rightarrow x(ab - b^2) = -ab(a - b)$

$\Rightarrow x(a - b)b = -ab(a - b)$

$\therefore x = \dfrac{-ab(a-b)}{(a-b)b} = $ -a

On substituting x = -a in (i), we get:

$b^2(-a) - a^2y = -a^2b - b^2a$

$\Rightarrow -b^2a - a^2y = -a^2b - b^2a$

$\Rightarrow -a^2y = -a^2b$

$\Rightarrow y = b$

Hence, the solution is x = -a and y = b.

47.   Solve for x and y:

$\dfrac{bx}{a} + \dfrac{ay}{b} = a^2 + b^2$, x + y = 2ab

Sol:

The given equations are:

$\dfrac{bx}{a} + \dfrac{ay}{b} = a^2 + b^2$

By taking LCM, we get:

$\dfrac{b^2x + a^2y}{ab} = a^2 + b^2$

$\Rightarrow b^2x + a^2y = (ab)a^2 + b^2$

$\Rightarrow b^2x + a^2y = a^3b + ab^3$ …..(i)

Also, x + y = 2ab   …….(ii)

On multiplying (ii) by a^2, we get:

$a^2x + a^2y = 2a^3b$ ……(iii)

On subtracting (iii) from (i), we get:

$(b^2 - a^2)x = a^3b + ab^3 - 2a^3b$

$\Rightarrow (b^2 - a^2)x = -a^3b + ab^3$

$\Rightarrow (b^2 - a^2)x = ab(b^2 - a^2)$

$\Rightarrow (b^2 - a^2)x = ab(b^2 - a^2)$

$\therefore x = \dfrac{ab(b^2 - a^2)}{(b^2 - a^2)} = ab$

On substituting x = ab in (i), we get:

$b^2(ab) + a^2y = a^3b + ab^3$

$\Rightarrow a^2y = a^3b$

$\Rightarrow \dfrac{a^3b}{a^2} = ab$

Hence, the solution is x = ab and y = ab.

48. Solve for x and y:

$x + y = a + b$, $ax - by = a^2 - b^2$

Sol:

The given equations are

$x + y = a + b$ ………(i)

$ax - by = a^2 - b^2$ ………(ii)

From (i)

$y = a + b - x$

Substituting $y = a + b - x$ in (ii), we get

$ax - b(a + b - x) = a^2 - b^2$

$\Rightarrow ax - ab - b^2 + bx = a^2 - b^2$

$\Rightarrow x = \dfrac{a^2 + ab}{a + b} = a$

Now, substitute $x = a$ in (i) to get

$a + y = a + b$

$\Rightarrow y = b$

Hence, $x = a$ and $y = b$.

49. Solve for x and y:

$a^2x + b^2y = c^2$, $b^2x + a^2y = d^2$

Sol:

The given equations are

$a^2x + b^2y = c^2$ ………(i)

$b^2x + a^2y = d^2$ ………(ii)

Multiplying (i) by a^2 and (ii) by b^2 and subtracting, we get

$a^4x - b^4x = a^2c^2 - b^2 d^2$

$\Rightarrow x = \dfrac{a^2c^2 - b^2d^2}{a^4 - b^4}$

Now, multiplying (i) by b^2 and (ii) by a^2 and subtracting, we get

$b^4y - a^4y = b^2c^2 - a^2 d^2$

$\Rightarrow y = \dfrac{b^2c^2 - a^2d^2}{b^4 - a^4}$

Hence, $x = \dfrac{a^2c^2 - b^2d^2}{a^4 - b^4}$ and $y = \dfrac{b^2c^2 - a^2d^2}{b^4 - a^4}$.

50. Solve for x and y:

$\dfrac{x}{a} + \dfrac{y}{b} = a + b$, $\dfrac{x}{a^2} + \dfrac{y}{b^2} = 2$

Sol:

The given equations are

$\dfrac{x}{a} + \dfrac{y}{b} = a + b$ …….(i)

$\dfrac{x}{a^2} + \dfrac{y}{b^2} = 2$ ……(ii)

Multiplying (i) by b and (ii) by b^2 and subtracting, we get

$\frac{bx}{a} - \frac{b^2 x}{a^2} = ab + b^2 - 2b^2$

$\Rightarrow \frac{ab - b^2}{a^2} x = ab - b^2$

$\Rightarrow x = \frac{(ab - b^2)a^2}{ab - b^2} = a^2$

Now, substituting $x = a^2$ in (i) we get

$\frac{a^2}{a} + \frac{y}{b} = a + b$

$\Rightarrow \frac{y}{b} = a + b - a = b$

$\Rightarrow y = b^2$

Hence, $x = a^2$ and $y = b^2$.