

Exercise 3B

Question 24:

$$\begin{aligned} &2(ax-by)+(a+4b)=0\\ &2ax-2by=-(a+4b)---(1)\\ &2bx+2ay=-(b-4a)---(2)\\ &Multiplying (1) by a and (2) by b\\ &2a^2x-2aby=-a(a+4b)---(4)\\ &2b^2x+2aby=-b(b-4a)---(4)\\ &Adding (3) and (4), we get\\ &2a^2x+2b^2x=-a(a+4b)-b(b-4a)\\ &2\left(a^2+b^2\right)x=-a^2-4ab-b^2+4ab\\ &2\left(a^2+b^2\right)=-\left(a^2+b^2\right)\\ &x=-\frac{a^2+b^2}{2\left(a^2+b^2\right)}=-\frac{1}{2}\\ &Putting \ x=\frac{-1}{2} \ in (1), we get\\ &2a\times\frac{-1}{2}-2by=-(a+4b)\\ &-a-2by=-a-4b\\ &-2by=-a-4b+a\\ &-2by=-4b\Rightarrow y=\frac{-4b}{-2b}=2\\ &\therefore \ solution \ is \ x=-\frac{1}{2}, \ y=2 \end{aligned}$$

Question 25:

The given equations are

$$71x + 37y = 253 - (1)$$

$$37x + 71y = 287 - (2)$$

Adding (1) and (2)

$$108x + 108y = 540$$

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

$$x + y = \frac{540}{108} = 5$$
 —-(3)

Subtracting (2) from (1)

$$34x - 34y = 253 - 287 = -34$$

$$34(x - y) = -34$$

$$x - y = -\frac{34}{34} = -1$$
 —(4)

Adding (3) and (4)

$$2x = 5 - 1 = 4$$
 $\Rightarrow x = 2$

Subtracting (4) from (3)

$$2y = 5 + 1 = 6$$

 $\Rightarrow y = 3$

Hence solution is x = 2, y = 3

Question 26:

$$37x + 43y = 123 - -(1)$$

$$43x + 37y = 117 - -(2)$$

Adding (1) and (2)

$$80x + 80y = 240$$

$$80(x + y) = 240$$

$$x + y = \frac{240}{80} = 3$$
 -- (3)

Subtracting (1) from (2),

$$6x - 6y = -6$$

$$6(x - y) = -6$$

$$x - y = \frac{-6}{6} = -1$$
 --- (4)

Adding (3) and (4)

$$2x = 3 - 1 = 2$$

$$\Rightarrow x = 1$$

Subtracting (4) from (3),

$$2y = 3 + 1 = 4$$

$$\Rightarrow$$
 y = 2

Hence solution is x = 1, y = 2

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