Exercise 3B

Question 24:

$2(ax - by) + (a + 4b) = 0$
$2ax - 2by = -(a + 4b)$ ---(1)
$2bx + 2ay = -(b - 4a)$ ---(2)
Multiplying (1) by a and (2) by b

$$2a^2x - 2aby = -a(a + 4b) - - - (3)$$

$$2b^2x + 2aby = -b(b - 4a) - - - (4)$$

Adding (3) and (4), we get

$$2a^2x + 2b^2x = -a(a + 4b) - b(b - 4a)$$

$$2(a^2 + b^2)x = -a^2 - 4ab - b^2 + 4ab$$

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

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

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

Question 25:

The given equations are

$71x + 37y = 253$ —(1)

$37x + 71y = 287$ —(2)

Adding (1) and (2)

$108x + 108y = 540$

$108(x + y) = 540$

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

Subtracting (2) from (1)

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

$34(x - y) = -34$

$\therefore x - y = -\frac{34}{34} = -1$ —(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 $x = 1, y = 2$

********** END **********