Exercise 3B

Question 22:

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

Taking L.C.M, we get

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

$$b^2x+a^2y=ab\left(a^2+b^2\right)---(1)$$

$$x+y=2ab \qquad ---(2)$$

Multiplying (1) by 1 and (2) by

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

$$a^2x+a^2y=2a^3b \qquad ---(4)$$

Subtracting (4) from (3), we get

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

$$x\left(b^2-a^2\right)=ab^3-a^3b$$

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

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

Substituting x = ab in (3), we get

$$b^2\times ab+a^2y=a^3b+ab^3$$

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

$$a^2y=a^3b+ab^3-b^3a$$

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

Therefore solution is x = ab, y = ab

Question 23:

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

$6ax + 6by = 3a + 2b$ —(1)

$6(bx - ay) = 3b - 2a$

$6bx - 6ay = 3b - 2a$ —(2)

$6ax + 6by = 3a + 2b$ —(1)

$6bx - 6ay = 3b - 2a$ —(2)

Multiplying (1) by a and (2) by b

$6a^2x + 6aby = 3a^2 + 2ab$ ---(3)

$6b^2x - 6aby = 3b^2 - 2ab$ ---(4)

Adding (3) and (4), we get

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

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

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

Substituting in (1), we get

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

$$3a + 6by = 3a + 2b$$

$$6by = 3a + 2b - 3a$$

$$6by = 2b$$

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

Hence, the solution is

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

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