

Exercise 3B

Question 22:

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

Taking L.C.M, we get

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

$$b^{2}x + a^{2}y = ab(a^{2} + b^{2}) - - - (1)$$

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

Multiplying (1) by 1 and (2) by

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

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

Subtracting (4) from (3), we get

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

 $\times (b^{2} - a^{2}) = ab^{3} - a^{3}b$
 $\times (b^{2} - a^{2}) = ab(b^{2} - a^{2})$
 $\times = \frac{ab(b^{2} - a^{2})}{(b^{2} - a^{2})} = ab$

Substituting x = ab in (3), we get

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

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

Therefore solution is x = ab, y = ab

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

 $6ax + 6by = 3a + 2b - (1)$
 $6(bx - ay) = 3b - 2a$
 $6bx - 6ay = 3b - 2a - (2)$
 $6ax + 6by = 3a + 2b - (1)$
 $6bx - 6ay = 3b - 2a - (2)$
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

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

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

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

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 ******