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Solution of a Pair of Linear Equations in Two Variables

Word Problems (Use Elimination Method)

Solve for x and y.

(I) $7x - 2y/xy = 5$_____ (a)

$8x + 7y/xy = 15$_____ (b)

Solution: Taking eqn. (a)

$7x - 2y/x\,y = 5$

$\Rightarrow 7x/xy - 2y/x\,y = 5$

$\Rightarrow 7/y - 2/x = 5$ ... (i)

Taking eqn. (b)

$\Rightarrow 8x + 7y/xy = 15$

$\Rightarrow 8x/xy + 7y/xy = 15$

$\Rightarrow 8/y + 7/x = 15$ ... (ii)

Let $1/x = p$ and $1/y = q$ in (i) and (ii) we get,

$7q - 2p = 5$ ... (iii)

$8q + 7p = 15$ ... (iv)

Multiplying equation (iii) by 7 and multiplying equation (iv) by 2 we get,

$49q - 14p = 35$ ... (v)

$16q + 14p = 30$ ... (vi)

Now, adding equation (v) and (vi) we get,

$49q - 14p + 16q + 14p = 35 + 30$

$\Rightarrow 65q = 65$

$\Rightarrow q = 1$

Putting the value of q in equation (iv)

$8 + 7p = 15$

$\Rightarrow 7p = 7 \Rightarrow p = 1$

Now,

$p = 1/x = 1$

$\Rightarrow 1/x = 1 \Rightarrow x = 1$

also, $q = 1 = 1/y$

$\Rightarrow 1/y = 1$

$\Rightarrow y = 1$

Hence, x =1 and y = 1 is the solution.

Do your Self

(i) $6x + 3y = 6xy$

$2x + 4y = 5xy$

(ii) $\frac{7x-2y}{xy} = 5$

$\frac{8x+7y}{xy} = 15$, ($x \neq 0$ and $y \neq 0$)

(iii) $3(x+2y) = 7xy$

$3(x+3y) = 11xy$, ($x \neq 0$ and $y \neq 0$)

(iv) $\frac{xy}{x+y} = \frac{6}{5}$

$\frac{xy}{y-x} = 6$ ($x \neq 0$, $y \neq 0$ and $x \neq y$)