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# PAIR OF LINEAR EQUATIONS

Cross - Multiplication Method  
Chapter: 3, Exercise: 3.5 ✓

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pairs of linear equations has unique solution, no solution, or infinitely many solutions. In case there is a unique solution, find it by using cross multiplication method:

$$x - 3y - 3 = 0$$

$$3x - 9y - 2 = 0$$

$$\left( \frac{a_1}{a_2} = \frac{1}{3}, \frac{b_1}{b_2} = \frac{-3}{-9} = \frac{1}{3} \right)$$

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

$$\frac{c_1}{c_2} = \frac{-3}{-2} = \frac{3}{2}$$

↳ parallel line

No solution



$$2x + y = 5$$

$$3x + 2y = 8$$

$$\boxed{4+1=5}$$
$$\boxed{6+2=8}$$

$$\frac{a_1}{a_2} = \frac{2}{3}, \quad \frac{b_1}{b_2} = \frac{1}{2}, \quad \frac{c_1}{c_2} = \frac{5}{8}$$

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2} =$  *intersecting line (Unique)*

$$2x + y - 5 = 0, \quad 3x + 2y - 8 = 0$$

$$\frac{x}{1 \times (-8) - 2 \times (-5)} = \frac{y}{-5 \times 3 - (-8) \times 2} = \frac{c}{2 \times 2 - 3 \times 1}$$
$$\frac{x}{-8 + 10} = \frac{y}{-15 + 16} = \frac{c}{4 - 3}$$
$$\frac{x}{2} = \frac{y}{1} = \frac{c}{1}$$

$x$	$y$	$c$	$x$
2	1	-5	2
3	2	-8	3

$$\frac{x}{2} = \frac{c}{1} \Rightarrow \boxed{x=2}$$

$$\frac{y}{1} = \frac{c}{1} \Rightarrow \boxed{y=1}$$



$$3x - 5y = 20$$

$$6x - 10y = 40$$

$$\frac{a_1}{a_2} = \frac{3}{6} = \frac{1}{2}, \quad \frac{b_1}{b_2} = \frac{-5}{-10} = \frac{1}{2}, \quad \frac{c_1}{c_2} = \frac{20}{40} = \frac{1}{2}$$

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$$\boxed{\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}}$$



(Coincident lines)

[ Any finite  
may  
solution ]

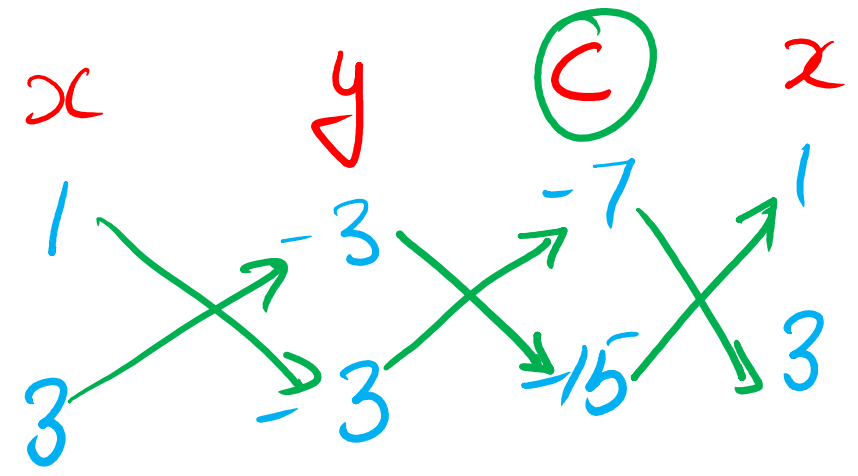


$$x - 3y - 7 = 0$$

$$4 - (3)(-1) = 4 + 3 = 7$$

$$3x - 3y - 15 = 0$$

$$\frac{a_1}{a_2} = \frac{1}{3}, \frac{b_1}{b_2} = \frac{-3}{-3} = 1, \frac{c_1}{c_2} = \frac{-7}{-15} = \frac{7}{15} \left( \frac{a_1}{a_2} \neq \frac{b_1}{b_2} \right) \rightarrow \text{Intersecting line (Unique)}$$



$$\frac{x}{-3x(-15) - (-3)(-7)} = \frac{y}{-7 \times 3 - (-15) \times 1} = \frac{C}{1 \times (-3) - (3)(-3)}$$

$$\frac{x}{45 - 21} = \frac{y}{-21 + 15} = \frac{C}{-3 + 9}$$

$$\left[ \frac{x}{24} \right] = \left[ \frac{y}{-6} \right] = \left[ \frac{C}{6} \right]$$

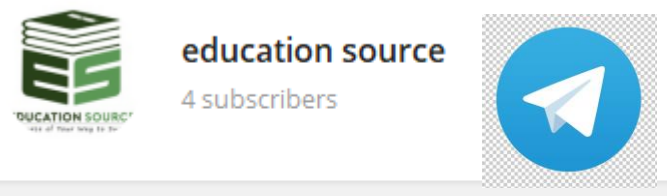
$$\frac{x}{24} = \frac{C}{6} \Rightarrow x = \frac{24 \times C}{6} = 4C$$

$$\frac{y}{-6} = \frac{C}{6} \Rightarrow y = -1C = -1$$





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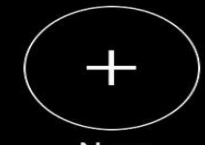
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