

# PAIR OF LINEAR EQUATIONS - II

Class: IX, Mathematics.

①

IIT FOUNDATION

SOLUTIONS

## TEACHING TASK

01.  $(x, y) = (\frac{1}{2}, 1)$  satisfies the given equations

$$\begin{aligned} \frac{12}{2x+3y} + \frac{5}{3x-2y} &= -7 & \frac{8}{2x+3y} + \frac{6}{3x-2y} &= -10 \\ & & & \\ &= \frac{12}{2(\frac{1}{2})+3(1)} + \frac{5}{3(\frac{1}{2})-2(1)} &= \frac{8}{2(\frac{1}{2})+3(1)} + \frac{6}{3(\frac{1}{2})-2(1)} \\ &= \frac{12}{4} + \frac{10}{-1} &= \frac{8}{4} + \frac{12}{-1} \\ &= \frac{12-40}{4} &= \frac{8-48}{4} \\ &= -\frac{28}{4} &= -\frac{40}{4} \\ &= -7 &= -10. \end{aligned}$$

Ans: A

02.  $4x + py - 21 = 0$   
 $px - 2y - 15 = 0$

$$\frac{4}{p} \neq \frac{p}{-2}$$

$$\Rightarrow p^2 \neq -16$$

$$= p \neq \sqrt{-16}, \text{ which is not real}$$

Ans: D

03.

$$\frac{a+b+c}{2} = a+5 \rightarrow \textcircled{1}$$

$$\frac{a+b+c}{2} = b+3 \rightarrow \textcircled{2}$$

$$\frac{a+b+c}{2} = c+2 \rightarrow \textcircled{3}$$

$$\textcircled{1} + \textcircled{2} + \textcircled{3} \Rightarrow \frac{3(a+b+c)}{2} = (a+b+c) + 10$$

$$\Rightarrow a+b+c = 20$$

Ans: D

04

05

$$\text{Let Rs } 100 \rightarrow x$$

$$\text{Rs } 50 \rightarrow y$$

$$\text{Rs } 10 \rightarrow 13 - x - y$$

$$\text{Given } 10(13 - x - y) + 50y + 100x = 830$$

$$\Rightarrow 9x + 4y = 70 \rightarrow \textcircled{1}$$

Since  $x > y$ possible  $x$  and  $y$  values

$$x = 6, y = 4$$

$$\therefore \text{No. of Rs } 10 \text{ notes} = 13 - 6 - 4 = 3$$

Ans: B

06.

Let the two digit number be  $xy$ 

$$\text{Given } 9(10x + y) - 17 = 10x$$

$$10x + y = 9(x + y) - 17$$

$$\Rightarrow x - 8y + 17 = 0 \rightarrow \textcircled{1}$$

$$\text{Also } 10x + y = 13(x - y) + 21$$

$$\Rightarrow 3x - 14y + 21 = 0 \rightarrow \textcircled{2}$$

$$\text{solving } x = 7, y = 3$$

$$\text{Required no} = 73$$

Ans: B

07 Let monthly Salary = Rs.  $x$ .

Annual increment = Rs.  $y$

(3)

According to given problem

$$x + 6y = 22500 \rightarrow (1)$$

$$x + 11y = 30000 \rightarrow (2)$$

Solving  $x = 13,500, y = 1500$

Salary after 8 years =  $x + 8y$

$$= 13,500 + 8 \times 1500$$

$$= \text{Rs } 25,500.$$

Ans: B

08 let the fraction be  $\frac{x}{y}$

$$\frac{x-1}{y+1} = \frac{1}{2} \Rightarrow x - y - 3 = 0 \rightarrow (1)$$

$$x + 1$$

$$\frac{x+1}{y-1} = \frac{4}{5} \Rightarrow 5x - 4y + 9 = 0 \rightarrow (2)$$

Solving (1) & (2)  $x = 7$

Ans: C

09. Let the speed of the boat in still water =  $x$  km/hr

∴ speed of the water =  $(10 - x)$  km/hr

Speed of down stream =  $x + (10 - x) = 10$  km/hr

" " up stream =  $x - (10 - x) = 2x - 10$  km/hr

Let the distance be  $n$  Km

According to problem

$$\frac{D}{10} = \frac{40}{100} \times \frac{D}{2x-10} \Rightarrow x = 7 \text{ km/hr}$$

$$\text{Difference of speeds} = 10 - (2x - 10)$$

$$= 10 - (2 \times 7 - 10)$$

$$= 6 \text{ km/hr}$$

Ans: B



10. Let the brothers be  $x$  and sisters be  $y$   
 Deepa  $y-1 = x \Rightarrow x - y - 1 = 0 \rightarrow (1)$  (4)  
 Dheeraj  $2(x-1) = y \Rightarrow 2x - y - 2 = 0 \rightarrow (2)$   
 Solving (1) & (2)  $\Rightarrow x = 3$ .  
 Ans: B

11.  $x + 2y + 3 = 0 \rightarrow (1)$   
 $4x + 5y + 6 = 0 \rightarrow (2)$   
 Solving  $x = 1, y = -2$   
 Ans: B, C

12.  $4x - 3y = 7xy \rightarrow (1)$   
 $3x + 2y = 18xy \rightarrow (2)$   
 $x = \frac{1}{3}, y = \frac{1}{4}$  Satisfies above equations  
 Ans: B, C

13. Statement I:  $2x - 3y + 6 = 0 \rightarrow (1)$   
 $x + y + 7 = 0 \rightarrow (2)$   
 $\therefore \frac{2}{1} \neq \frac{-3}{1}$  i.e.  $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$   
 The two lines intersect each other, hence have  
 an unique solution. (True)  
Statement II: Conceptual (True)  
 Ans: A

14. According to the problem  
 $6x + 5y + 7z = 115 \rightarrow (1)$   
 $8x + 10y + 14z = 190 \rightarrow (2)$   
 $(1) \times 2 \Rightarrow 12x + 10y + 14z = 230$   
 $(2) \Rightarrow \underline{8x + 10y + 14z = 190}$   
 $\underline{4x = 40} \Rightarrow x = 10$ .  
 Cost of Book Can be found uniquely.

Ans:

(5)

15  $2x - 3y + 7 = 0$

$4x - y + 8 = 0$

$\frac{2}{4} \neq \frac{-3}{-1} \quad \text{i.e.} \quad \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

Hence, the lines intersect to each other. Ans: B

16

17 A)  $2x - 2y + 3 = 0$

$x + y - 7 = 0$

$\frac{2}{1} \neq \frac{-2}{1} \quad \text{i.e.} \quad \text{The lines intersect each other}$

Hence, have a Unique solution, Consistent.

B)  $x - y + 8 = 0$

$x + y - 8 = 0$

$\frac{1}{1} \neq \frac{-1}{1} \quad \text{i.e.} \quad \text{The lines intersect each other}$

Hence have Unique solution, Consistent.

Ans: D

18 a)  $2x - 2y + 3 = 0$

$x + y - 7 = 0$

$\frac{2}{1} \neq \frac{-2}{1} \Rightarrow \text{Lines are intersect, Consistent}$

b)  $x + y + 3 = 0$

$2x + 2y + 6 = 0$

$\frac{1}{2} = \frac{1}{2} = \frac{3}{6} \Rightarrow \text{Lines coincide, Consistent}$

c)  ~~$x + y + 3 = 0$~~

$x + y + 3 = 0$

$x - y + 8 = 0$

$\frac{1}{1} \neq \frac{1}{-1} \Rightarrow \text{Lines intersect, Consistent.}$



19. Let A's age =  $x$  years

(6)

B's age =  $y$  years

$\therefore x + y = 61 \rightarrow (1)$

Given  $y - (x - y) = \frac{x}{2} - 4$

$\Rightarrow 3x - 4y - 8 = 0 \rightarrow (2)$

Solving  $y = 25$  years

Ans: 25

20. Let length =  $x$ , breadth =  $y$

Given  $(x+2) \cdot (y+2) = 504 + xy$

$\Rightarrow xy + 2(x+y) + 4 = 504 + xy$

$\Rightarrow 2(x+y) = 500$

Hence perimeter = 50.

Ans: 50

21 a)  $2x - 3y = 5$

$(3, a) \Rightarrow 2(3) - 3a = 5$

$\Rightarrow 3a = 1 \Rightarrow a = \frac{1}{3}$

ii)  $\begin{cases} x + y - 2 = 0 \\ 2x - y - 1 = 0 \end{cases}$  solving  $(x, y) = (1, 1)$

$x - y = 0$  satisfies above ~~at~~ point  $(1, 1)$

iii)  $3x + 4y - 24 = 0$

Area =  $\frac{c^2}{2|ab|} = \frac{(-24)^2}{2 \times 3 \times 4} = \frac{144}{8} \text{ sq. units}$

iv)  $2x + 3y - 11 = 0$ ,  $2x - 4y + 24 = 0$

solving  $(x, y) = (-2, 5)$

$y = mx + 3 \Rightarrow 5 = -2x + 3 \Rightarrow x = -1$

(i)  $2x - 3y + 8 = 0$   
 $2x - 3y + 9 = 0$   
 parallel lines

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \quad (7)$$

(ii)  $x + y + 7 = 0$   
 $2x + 2y + 14 = 0 \Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Coincidence lines

(iii)  $3x - 2y + 7 = 0$   
 $2x + 3y + 8 = 0 \Rightarrow a_1 a_2 + b_1 b_2 = 0$

perpendicular lines

(iv)  $x + y + 8 = 0$   
 $2x + y + 9 = 0 \Rightarrow \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

intersecting lines