

7. PAIR OF LINEAR EQUATIONS ^①

Class: IX . MATHEMATICS

INTEGRATED. SOLUTIONS

2025/26

TEACHING TASK JEE MAINS LEVEL

01. option A $(\frac{1}{2}, 1)$ satisfies the given equations

$$\begin{aligned} \text{LHS} &= \frac{12}{2x+3y} + \frac{5}{3x-2y} \\ &= \frac{12}{2(\frac{1}{2})+3(1)} + \frac{5}{3(\frac{1}{2})-2(1)} \\ &= \frac{12}{4} + \frac{10}{-1} \\ &= -7 = \text{RHS} \end{aligned}$$
$$\begin{aligned} \text{LHS} &= \frac{8}{2x+3y} + \frac{6}{3x-2y} \\ &= \frac{8}{2(\frac{1}{2})+3(1)} + \frac{6}{3(\frac{1}{2})-2(1)} \\ &= \frac{8}{4} + \frac{12}{-1} \\ &= -10 = \text{RHS} \end{aligned}$$

Ans. A

02. $4x + py - 21 = 0$ and $px - 2y - 15 = 0$
Equations have unique solution

$$\Rightarrow \frac{4}{p} \neq \frac{-p}{-2}$$
$$\Rightarrow p^2 \neq -8$$

Any real no. satisfies the above inequation.

Ans. D

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

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

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

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

Ans: D

04 $p \Rightarrow$ Lines has unique solution
 $q \Rightarrow$ Lines has no solution
 $r \Rightarrow$ Lines has infinite no. of solutions
 $\therefore p \text{ \& } r$ are consistent

Ans: C

05 Let Rs. 100 $\rightarrow x$, Rs. 50 $\rightarrow y$, Rs. 10 $\rightarrow 13-x-y$
 Now, $10(13-x-y) + 50y + 100x = 830$
 $\Rightarrow 9x + 4y = 70 \rightarrow \textcircled{1}$
 Since $x > y$, possible x and y values are
 $x=6, y=4$
 $\therefore$ No. of Rs. 10 notes = $13-6-4 = 3$ Ans: B

06 Let the two digit number be xy
 $\therefore 10x+y = 9(x+y) \rightarrow \textcircled{1}$
 $\Rightarrow x-8y+17=0 \rightarrow \textcircled{1}$
 Also, $10x+y = 13(x-y)+21$
 $\Rightarrow 3x-14y+21=0 \rightarrow \textcircled{2}$
 Solving $x=7, y=3$
 Required no = 73

Ans: B

07. let the monthly salary = Rs. x (3)
 Annual increment = Rs. y
 Given $x + 6y = 225000 \rightarrow (1)$
 $x + 11y = 300000 \rightarrow (2)$

Solving $x = 13,500$, $y = 1500$
 Salary after 8 years = $x + 8y$
 $= 13500 + 8(1500)$
 $= \text{Rs } 25,500$ Ans. B

08 let the fraction be $\frac{x}{y}$
 Given $\frac{x-1}{y+1} = \frac{1}{2}$ and $\frac{x+1}{y-1} = \frac{4}{5}$
 Solving $x = 7$ Ans. C

09. let the speed of the boat in still water
 $= x \text{ Km/hr}$
 Speed of the water = $(10-x) \text{ Km/hr}$
 Speed of the down stream = $x + 10 - x = 10$
 Speed of the upstream = $x - (10-x) = 2x - 10$
 let the distance be $D \text{ Km}$.
 According to the problem
 $\frac{D}{10} = \frac{40}{100} \times \frac{D}{2x-10} \Rightarrow x = 7 \text{ Km/hr}$
 Difference of speeds = $10 - (2x - 10)$
 $= 20 - 2x = 20 - 2 \times 7$
 $= 6 \text{ Km/hr}$
 Ans. B

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

JEE ADVANCED LEVEL

11. Let $a_1=1, a_2=2, a_3=3, a_4=4, a_5=5, a_6=6$
 We have $x+2y+3=0$
 $4x+5y+6=0$
 Solving, we get $x=1$ and $y=-2$ Ans: B, C

12. $4x-3y=7xy$; $3x+2y=18xy$

option verification

$x=\frac{1}{3}$ and $y=\frac{1}{4}$ satisfies the

above equations

Ans: B, C

13. Statement I: $\frac{2}{1} \neq \frac{-3}{1}$ (True)

Statement II: Conceptual (True)

Ans: A

14. Statement I: $6x+5y+7z=115 \rightarrow (1)$
 $8x+10y+14z=190 \rightarrow (2)$

$(1) \times 2 \Rightarrow$
 $12x+10y+14z=230$
 $- 8x+10y+14z=190$

$\Rightarrow 4x=40 \Rightarrow x=10$

$\therefore$ Cost of each book can be found uniquely

Statement II: Conceptual (True)

Ans.. A

(5)

15 $\begin{cases} 2x - 3y + 7 = 0 \\ 4x - y + 8 = 0 \end{cases} \left\{ \frac{2}{4} \neq \frac{-3}{-1} \Rightarrow \text{Lines intersect} \right.$

Ans.. B

16 $\times$ A) $\frac{3}{2} \neq \frac{-2}{3} \checkmark$
D) $\frac{1}{2} \neq \frac{-1}{1} \checkmark$

Ans.. A, D

17 A) $\frac{2}{1} \neq \frac{-2}{1} \Rightarrow \text{Unique solution} \checkmark$
B) $\frac{1}{1} \neq \frac{-1}{1} \Rightarrow \text{Unique solution} \checkmark$
C) $\frac{1}{2} = \frac{-1}{-2} = \frac{3}{6} \Rightarrow \text{Infinite solution} \checkmark$

Ans: A, B, C, D

18 A) $\frac{2}{1} \neq \frac{-2}{1} \Rightarrow \text{Unique solution} \times$
B) $\frac{1}{2} = \frac{1}{2} = \frac{3}{6} \Rightarrow \text{Infinite solutions} \times$
C) $\frac{1}{1} \neq \frac{1}{-1} \Rightarrow \text{Unique solution} \times$

Ans: —

19. Let A's age = x years, B's age = y years
Given $x + y = 61$ years $\rightarrow$ (1)

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

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

Solving (1) & (2) $\Rightarrow y = 25$ years

Ans: 25

26. let length = x , breadth = y

(6)

$$\text{Given } (x+2) \cdot (y+2) = xy + 5.4$$

$$\Rightarrow xy + 2(x+y) + 4 = xy + 5.4$$

$$\Rightarrow 2(x+y) = 5.4$$

$$\text{Hence, perimeter} = 5.4$$

Ans: 50

2) i) $2x - 3y = 5$
 $(3, a) \Rightarrow 2(3) - 3(a) = 5 \Rightarrow a = \frac{1}{3} (t)$

ii) $x + y = 2$, $2x - y = 1 \rightarrow \text{solving}$

$$(x, y) = (1, 1)$$

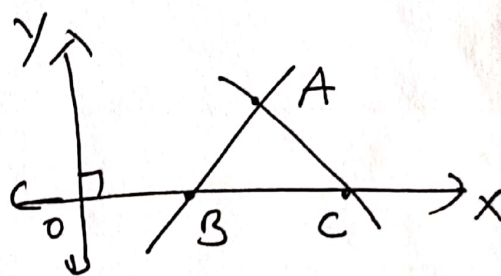
$$: x - y = 0 \text{ satisfies } (1, 1) (P)$$

(iii) $3x - 4y + 3 = 0$
 $3x + 4y - 21 = 0$

Solving $A = (3, 3)$

$$B = (-1, 0)$$

$$C = (7, 0)$$



$$\text{Area} = \frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$$
$$= \frac{1}{2} |3(0 - 0) - 1(0 - 3) + 7(3 - 0)|$$
$$= 12 (x)$$

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

Solving $(-1, 5)$

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

$$\Rightarrow x = -1 (s)$$

Ans: t, P, x, s

- 22 i) $\frac{2}{3} = \frac{-3}{-3} \neq \frac{8}{9} \rightarrow \text{parallel (q)}$
- ii) $\frac{1}{2} = \frac{1}{2} = \frac{7}{14} \rightarrow \text{Coincidence (x)}$
- iii) $\frac{3}{2} \neq -\frac{2}{3} \rightarrow \text{intersecting (P)}$
- iv) $\frac{1}{2} \neq \frac{1}{1} \rightarrow \text{intersecting (P)}$
- Ans: q, x, P, P

LEARNERS TASK (CUES)

01.	Conceptual	Ans: D
02	Conceptual	Ans: C
03	Conceptual	Ans: D
04	Conceptual	Ans: D
05	$\frac{6}{2} = \frac{-3}{-1} = \frac{-3}{-1} \Rightarrow \text{lines coincide} \rightarrow \text{Infinite solutions}$	Ans: C
06	$\frac{2}{3} \neq -\frac{3}{2} \quad \therefore \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $2 \times 3 + (-3) \times 2 \Rightarrow a_1 a_2 + b_1 b_2 = 0$	Ans: Ans: D
07	all the given equations satisfies $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	Ans: D

08 option verification method

(2)

option (D) 35

(i) $3+5=8$ (ii) $35+18=53$, reverse = 35
Ans: D

09 let person's age = x years

Son's age = y years

Case (i) $x-4 = 4(y-4) \rightarrow (1)$

Case (ii) $x+6 = 3(y+6) \rightarrow (2)$

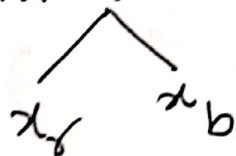
Solving (1) & (2) $x=44, y=14$ Ans: A

10 $x+y=30$ ($y>x$) $\Rightarrow y=x+6$

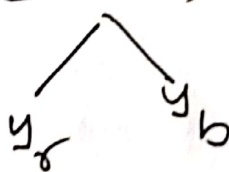
Now, $x+x+6=30 \Rightarrow x=12$ Ans: B

JEE MAINS LEVEL

01. Sachin (x)



Lara (y)



Given $x_y = y_b + 10 \rightarrow (1)$ $x_b = y_y - 5 \rightarrow (2)$

Given $x_y + y_y = 105 \rightarrow (3)$

$x_b = y_b - 10 \rightarrow (4)$

solving, $x_y = 60$

Ans: B

02 Correct questions = x
 Total questions = 60
 $\therefore$ Incorrect questions = $60 - x$
 Given $2x + (60 - x)(-1) = 90$
 $\Rightarrow x = 50$ (9) Ans. D

03 Krishna $\rightarrow x$ marbles ; Sudheer $\rightarrow y$ marbles
 Case (i) $x + 10 = (y - 10) + 40 \rightarrow (1)$
 Case (ii) $x + 40 = 5(y - 40) \rightarrow (2)$
 Solving (1) & (2) $y = 65$ Ans. A

04. Correct questions = x , total questions = 70
 $\therefore$ Wrong questions = $70 - x$
 Now, $x(1) + (70 - x)(-\frac{1}{2}) = 40 \Rightarrow x = 50$
 $\therefore$ Wrong answers = 20 Ans. B

05 Amar (x); Bhavan (y)
 Case (i) $y - 20 = \frac{1}{2}(x + 20) \rightarrow (1)$
 Case (ii) $x - 40 = \frac{1}{2}(y + 40) \rightarrow (2)$
 Solving (1) & (2) $y = 80$ Ans. D

06 Let $x = abc = 100a + 10b + c$
 After reversing $cba = 100c + 10b + a$
 Given $cba = abc - 891$
 $\Rightarrow abc - cba = 891$
 $\Rightarrow (100a + 10b + c) - (100c + 10b + a) = 891$

$$\Rightarrow a - c = 9$$

$$\Rightarrow c = a - 9 \text{ (or)} a = c + 9, c \geq 0 \text{ (10)}$$

$$\Rightarrow a \geq 9, \text{ But } a \leq 9$$

$$\Rightarrow a = 9, c = 0$$

Ans: A

07

$$\text{Given } abc = cba + 792$$

$$\Rightarrow 100a + 10b + c = 100c + 10b + a + 792$$

$$\Rightarrow a - c = 8$$

$$\Rightarrow a = c + 8$$

$$c \geq 0, a \geq 8$$

$$\text{If } c = 0 \quad A = 8 \text{ or } 9$$

Ans: C

08

Steps involved: A, D, B, C

Ans: D

09

present age: Shiva $\rightarrow x$ years
Ram $\rightarrow y$ years

$$\text{Case (i)} \quad x = 3y \rightarrow \textcircled{1}$$

$$\text{Case (ii)} \quad x + 10 < 2(y + 10)$$

$$\Rightarrow 3y + 10 < 2y + 20$$

$$\Rightarrow y < 10$$

$$\Rightarrow 3y < 30$$

$$\Rightarrow x < 30$$

$$\therefore x = 29 \text{ years}$$

Ans: D

10. Let 25 paise $\rightarrow x$ (W)
 50 paise $\rightarrow y$
 Ps. 1 coins $\rightarrow 220 - (x + y)$
Case (i) $25x + 50y + 100(220 - x - y) = 110 \times 100 \rightarrow (1)$

Case (ii) 25 paise $\rightarrow y$
 50 paise $\rightarrow x$
 Ps 1. Coin $\rightarrow 100 - (x + y)$
 Given $25y + 50x + 100(100 - x - y) = 8000 \rightarrow (2) \text{ paise}$
 Ans... D

Solving (1) & (2) $x + y = 200$

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11. $1010x + 1011y = 4040$
 $1011x + 1010y = 4044$

 $2021x + 2021y = 8084$

$\Rightarrow x + y = 4$

$\Rightarrow x = 4, y = 0$ satisfies above eqn

Ans... A, C

12. $\frac{3}{2}x + 2y = 1$ $\frac{x}{4} - \frac{y}{2} = 1$
 $3x + 4y - 2 = 0 \rightarrow (1)$ $\Rightarrow x - 2y - 4 = 0 \rightarrow (2)$

~~(1) - (2) $\Rightarrow 2x$~~ Solving (1) & (2)

$x = 2$ $y = -1$

Now, $x - y = 2 - (-1) = 2 + 1 = 3$

Ans. B

13. Statement I: *

12

$$2x - 3y = 18 \text{ and } 4x - y = 16.$$

solving $x = 3, y = -4$

$$(3, -4) \Rightarrow 5x - py - 23 = 0$$

$$5(3) - p(-4) - 23 = 0$$

$$\Rightarrow p = -2 \text{ (True)}$$

Statement II: Conceptual (True).

Ans. A

14. Statement I: Mother $\rightarrow x$ years

Son $\rightarrow y$ years

Case (i)

$$x + y = 2(x - 12) \rightarrow (1)$$

Also

$$(x + 9) \neq (y + 9) = 3(x - 14) \rightarrow (2)$$

solving

$$y = 12 \text{ (False)}$$

Statement II: Conceptual (True)

Ans. D

15. $2x - 3y + 7 = 0 \rightarrow (1)$; $x + y - 8 = 0 \rightarrow (2)$

solving (1) and (2) $\Rightarrow (x, y) = \left(-\frac{17}{5}, \frac{23}{5} \right)$

Ans. —

16. $(3, 4) \Rightarrow k + y - 7 = 0, k + 4 - 7 = 0 \Rightarrow k = 3$

Ans. C

17. $(x, y) = \left(-\frac{1}{24}, \frac{7}{24} \right)$ satisfies the given equation

Ans. C

$$18 \quad \frac{1}{2x+y} = m, \quad \frac{1}{3x+y} = n$$

(13)
Ans: C

$$19. \quad \begin{aligned} 173x + 197y &= 149 \\ 197x + 173y &= 221 \end{aligned}$$

$$370x + 370y = 370$$

$$\therefore x + y = 1$$

Ans: 1

$$20 \quad \text{Cows} \rightarrow x, \quad \text{hens} \rightarrow y$$

$$4x + 2y = 92 \rightarrow (1); \quad x + y = 29 \rightarrow (2)$$

$$\text{solving } x = 17$$

Ans: 17

$$21 \quad (i) \quad \begin{aligned} 2x + 3y &= 10 \\ 3x + 2y &= 5 \end{aligned}$$

$$\underline{5x + 5y = 15} \Rightarrow x + y = 3 \quad (q)$$

$$(ii) \quad 2x - 3y = 0$$

$$2x = 3y$$

$$\Rightarrow 2x + 3y = 3y + 3y = 6y \quad (p)$$

$$(iii) \quad \frac{x}{a} + \frac{y}{b} = 1 \Rightarrow bx + ay = ab$$

$$\frac{x}{b} + \frac{y}{a} = 1 \Rightarrow ax + by = ab$$

$$\text{Inconsistent} \Rightarrow \frac{b}{a} = \frac{a}{b} \Rightarrow a^2 - b^2 = 0 \Rightarrow a + b = 0 \quad (s)$$

$$(iv) \quad \begin{aligned} x + y &= 10 \quad (x > y) \\ x - y &= 4 \end{aligned} \quad \left| \quad \begin{aligned} \text{Solving } (x, y) &= (7, 3) \\ &(t) \end{aligned} \right.$$

Ans: q, p, s, t

22 i) $a+b=c$
 $a-b=d$
 $\hline$
 $2b=c-d$
 $\Rightarrow b = \frac{c-d}{2}$
 (b)

ii) $x+y=2$
 $x-y=3$
 Solving $(x,y) = (\frac{5}{2}, -\frac{1}{2})$
 $x^2+y^2 = \frac{25}{4} + \frac{1}{4} = \frac{26}{4} = \frac{13}{2}$ (P)

(iii) $x+y=0$
 $x-y=0$
 $\hline$
 $x=0, y=0$ not possible (Q)

(iv) $3x+2y=20 \rightarrow (1)$
 $4x-5y=42 \rightarrow (2)$
 $\Rightarrow 3(a+b)+2(a-b)=20$
 $4(a+b)-5(a-b)=42$
 Solving $b=5$ (r)

Ans: t, P, r

$\Rightarrow$ THE END $\Leftarrow$