

1. PAIR OF LINEAR EQUATIONS

Class: IX; MATHEMATICS

FOUNDATION: SOLUTIONS ①

2025-26

TEACHING TASK

JEE MAINS LEVEL

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

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

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

Ans: A

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

Equations have Unique solution

$$\Rightarrow \frac{4}{p} \neq \frac{-2}{-15} \Rightarrow p^2 \neq -8 \Rightarrow p \neq \sqrt{-8}$$

Which is not a real number.

Hence, any real value of p , gives the solution

Ans: D

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

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

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

$$3 + 3 + 3 \Rightarrow 3 \left(\frac{9 + 10 + 11}{2} \right) = (9 + 10 + 11) + 10 \quad \text{Ans. C}$$

$$\Rightarrow 9 + 10 + 11 = 20$$

04 $\rightarrow$ Graph has unique solution
 $\rightarrow$ Graph has infinite number of solutions
 p and x are constant

05 Let $\text{Rs } 100 \rightarrow x$, $\text{Rs } 50 \rightarrow y$, $\text{Rs } 10 \rightarrow 12 - x - y$
 Also, $10(12 - x - y) + 50y + 100x = 820$
 $\Rightarrow 9x + 4y = 70 \rightarrow \text{①}$
 ≤ 100 $x \geq 4$, possible x and y values are
 $x = 6, y = 4$.
 $\therefore \text{No. of Rs } 10 \text{ notes} = 12 - 6 - 4 = 3$ Ans. B

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

07 Let the monthly salary = Rs x .
 Annual increment = Rs y
 Given $12x + 6y = 22500 \rightarrow \text{①}$
 $x + 11y = 20000 \rightarrow \text{②}$
 Solving $x = 13,500, y = 1500$.

Salary after 8 years = $x + 8y$

$$= 13500 + 8(1500)$$

$$= \text{Rs } 25,500 \quad \text{Ans. B}$$

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 above equations $x = 7$

Ans: C

09 let the speed of the boat in still water = x Km/hr
speed of the water = $(10-x)$ Km/hr

$$\text{speed of the downstream} = x + 10 - x = 10$$

$$\text{speed of the upstream} = x - (10 - x) = 2x - 10$$

let the distance be D Km

According to the problem

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

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

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

$$= 6 \text{ Km/hr} \quad \text{Ans. B}$$

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

11 optm: B: $2x+3y=7, 3x-2y=4$

Ans: B

$\Rightarrow \frac{2}{3} \neq \frac{3}{-2}$

12 $x+y=5$; $2x+2y=10$

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

Lines coincide each other $\Rightarrow$ Infinite solution
Ans: C

13 $\frac{x}{2} + \frac{y}{3} = 2 \Rightarrow 3x+2y=12 \rightarrow (1)$

$\frac{x}{3} + \frac{y}{2} = \frac{13}{6} \Rightarrow 2x+3y=13 \rightarrow (2)$

Ans: B

Solving (1), (2) we get $x=2$

14 opt: A: $x+y=5$ and $2x+2y=10$

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

$\Rightarrow$ The lines coincide with each other

$\Rightarrow$ The equations have infinite number of solutions.

Ans: A

15 opt A: $f=55, f+10=3(s+10)$

These equations, suitable for given data

Key: A

JEE ADVANCED LEVEL

(5)

Q1. Let $a_1 = 1, a_2 = 2, a_3 = 3, a_4 = 4, a_5 = 5, a_6 = 6$ be the consecutive integers

$$\text{Now, } x + 2y + 3 = 0$$

$$4x + 5y + 6 = 0$$

Solving, we get $x = 1$ and $y = -2$ Ans: B, C

Q2. Speed of the boat in still water = x km/hr

Speed of the stream = y km/hr

Case(i): when boat rows down stream

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}} \Rightarrow \text{Time} = \frac{30}{x+y} \text{ hr}$$

Case(ii): when boat rows up stream

$$\text{Time} = \frac{18}{x-y} \text{ hr}$$

$$\text{According to given data} \Rightarrow \frac{30}{x+y} + \frac{18}{x-y} = 6$$

$$\text{and } y = 3 \text{ km/hr} \therefore \frac{30}{x+3} + \frac{18}{x-3} = 6$$

Ans: A, C

Q3. Statement I: $2x + 3y = 7$; $4x + 6y = 15$

$$\Rightarrow \frac{2}{4} = \frac{3}{6} \neq \frac{7}{15} \quad \therefore \frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$$

$\therefore$ The given equations are parallel to each other.
No solution. Inconsistent (True).

Statement II: Conceptual (True)

Ans: A

04 Statement I:

$$6x + 5y + 7z = 115 \rightarrow (1)$$

$$8x + 10y + 14z = 190 \rightarrow (2)$$

$$(1) \times 2 \Rightarrow \begin{array}{r} 12x + 10y + 14z = 230 \\ \underline{8x + 10y + 14z = 190} \\ 4x = 40 \end{array}$$

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

Cost of each book can be found uniquely (True).

Ans: A

Statement II: Conceptual (True)

05 $2x - 3y + 7 = 0$; $4x - y + 8 = 0$

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

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

06 opt: A: $3x - 2y + 7 = 0$
 $2x + 3y - 8 = 0$

opt D: $x - y + 8 = 0$

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

$$\therefore \text{for both options } \frac{a_1}{a_2} \neq \frac{b_1}{b_2}$$

Ans: A, D

07 fixed charges = Rs. x , Charge per 1 km = Rs. y

Given $x + 5y = 75$, $x + 8y = 105$

Ans: A

08 solving $x + 5y = 75$, $x + 8y = 105$

We get $x = \text{Rs. } 30$

Ans: B

69. Assertion: $x + 2y = 7$, $2x + 4y = 10$ (7)
 here $\frac{1}{2} = \frac{2}{4} \neq \frac{7}{10} \Rightarrow$ The lines are parallel.
 No-solution $\rightarrow$ Inconsistent (True).
Reason: Conceptual (True) Ans: A

10 Assertion: $2x + 3y = 50$; $4x + 6y = 100$
 $\Rightarrow \frac{2}{4} = \frac{3}{6} = \frac{50}{100} \Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$
 The two lines coincide each other
 $\Rightarrow$ Infinite number of solutions
 $\Rightarrow$ The system is consistent (True)
Reason: Conceptual (False) Ans: C

11. Let A's age = x years; 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

12 Let length = x , breadth = y
 Given $(x + 2) \cdot (y + 2) = 5.4 + 2xy$
 $\Rightarrow xy + 2(x + y) + 4 = 5.4 + 2xy$
 $\Rightarrow 2(x + y) = 50$
 Hence perimeter = 50 Ans: 50

13

$$3x + 2y = 12; \quad 6x + 4y = K$$

$$\Rightarrow \frac{3}{6} = \frac{12}{K} \Rightarrow K = 24$$

Ans: 24

(8)

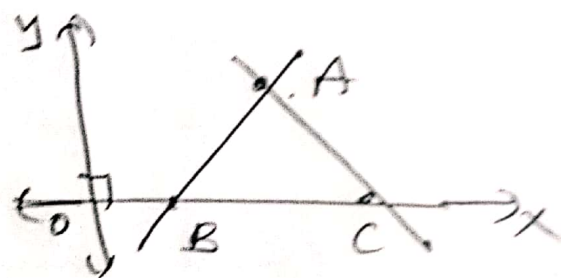
14 a) $2x - 3y = 5$

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

$$b) \begin{cases} x + y - 2 = 0 \\ 2x - y - 1 = 0 \end{cases} \text{ Solving } (x, y) = (1, 1)$$

$$c) \begin{cases} x - y = 0, \text{ satisfies } (1, 1) \\ 3x - 4y + 3 = 0 \\ 3x + 4y - 21 = 0 \end{cases}$$

$$\text{Solving } A = (3, 3) \\ B = (-1, 0) \\ C = (7, 0)$$



$$\text{Area} = \frac{1}{2} | 3(0-0) - 1(0-3) + 7(3-0) | \\ = \frac{1}{2} \times 24 = 12$$

$$d) \begin{cases} 2x + 3y - 11 = 0 \\ 2x - 4y + 24 = 0 \end{cases} \text{ Solving } (-2, 5)$$

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

Ans: t, p, r, s

15 a) $x + y = 20, \quad x - y = 4$

b) $2x + 3y = 18$

c) $f = 55, \quad f + 10 = 3(s + 10)$

d) $x + 5y = A, \quad x + 8y = B$

Ans: p, q, r, s

LEARNERS TASK (CUB'S) ⑨

01.	Conceptual	Ans: D
02.	Conceptual	Ans: C
03.	Conceptual	Ans: D
04.	Conceptual	Ans: D
05.	$6x - 3y - 3 = 0$; $2x - y - 1 = 0$ $\frac{6}{2} = \frac{-3}{-1} = \frac{-3}{-1}$ i.e. $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ Hence, the equations have infinite no. of solutions Ans: C	
06.	$2x - 3y + 7 = 0$; $3x + 2y - 8 = 0$ $\frac{2}{3} \neq \frac{-3}{2}$ i.e. $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ Also, $2 \times 3 + (-3) \times 2 \Rightarrow a_1 a_2 + b_1 b_2 = 0$ Ans: D	
07.	A) $2x + y + 7 = 0$; $x + y - 7 = 0$ $\frac{2}{1} \neq \frac{1}{1}$ i.e. $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ $\therefore$ The equations have unique solution. Remaining options B and C also satisfy the above conditions. Ans: D	
08.	<u>option verification method</u> <u>option: D (35)</u> (i) $3 + 5 = 8$ (ii) $35 + 18 = 53$, reverse 35 Ans: D	

09 let the age of person and his son (10)
 x and y years
 case (i) $x - 4 = 4(y - 4) \rightarrow (1)$
 case (ii) $x + 6 = 3(y + 6) \rightarrow (2)$
 $x = 44, y = 14$, satisfies above equations
 Ans: A

10 $x + y = 30 (y > x) \Rightarrow y = x + 6$
 Now, $x + x + 6 = 30 \Rightarrow x = 12$
 Ans: B

11 Conceptual
 Ans: C

12 Conceptual
 Ans: B

13 Conceptual
 Ans: C

14 Conceptual
 Ans: B

15 Conceptual
 Ans: B

IEEE MAINS LEVEL

01. Sachin (x)
 x_y x_b
 Lara (y)
 y_y y_b
 $x_y = y_b + 10 \rightarrow (1), x_b = y_y - 5 \rightarrow (2)$
 Given $x_y + y_y = 105 \rightarrow (3)$
 $x_b = y_b - 10 \rightarrow (4)$
 Solving we get $x_y = 60$
 Ans: B

02 Correction questions = x (11)
 Total questions = 60
 Incorrect questions = $60 - x$
 Given $2x + (60 - x)(-1) = 90$
 $\Rightarrow x = 50$ Ans. D

03 Krishna $\rightarrow x$ marbles; Sudha $\rightarrow y$ 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 answers = $70 - x$
 Now, $x(1) + (70 - x)(-\frac{1}{2}) = 40 \Rightarrow x = 50$
 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) and (2) $y = 80$ Ans. D

06 Let $X = abc \neq 100a + 10b + c$
 After reversing digits
 $cba = 100c + 10b + a$
 Given $cba = abc - 891$
 $\Rightarrow abc - cba = 891$

$$\Rightarrow (100a + 10b + c) - (100c + 10b + a) = 891$$

(12)

$$\Rightarrow a - c = 9$$

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

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

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

Ans. A

07 Given $abc = cba + 792$

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

$$\Rightarrow a - c = 8$$

$$\Rightarrow a = c + 8$$

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

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

Ans: C

08 Steps involved: A, D, B, C

Ans: D

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

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

Case (ii) $x + 10 < 2(y + 10)$

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

$$\Rightarrow y < 10$$

$$\Rightarrow 3y < 30$$

$$\Rightarrow x < 30$$

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

Ans: D

10 let 25 paise $\rightarrow x$
 50 paise $\rightarrow y$
 Rs. 1 Coins $\rightarrow 220 - (x + y)$ (B)

Case (i) $25x + 50y + 100(220 - x - y) = 110 \times 100$
 $\rightarrow$ (1)

Case (ii) 25 paise $\rightarrow y$

50 paise $\rightarrow x$

Rs. 1 coin $\rightarrow 100 - (x + y)$

Given $25y + 50x + 100(100 - x - y) = 8000$ $\rightarrow$ (2)
 paise

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

Ans: B

11. ~~Two, 23 paise coins~~

$x - 2y = 4 \rightarrow$ (1)

$3x + y = 7 \rightarrow$ (2)

(1) $\Rightarrow$ Solving $x = \frac{18}{7}$

Ans: —

12 $\left. \begin{array}{l} x + y = 4 \\ 2x + 2y = 8 \end{array} \right\} \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Infinitely many solutions

Ans: C

13 $4x - 5y - 7 = 0$; $3x + 2y - 11 = 0$

Solving $x = 3, y = 1$

Ans: —

14 Option: A $x + 3y = 40, x + 6y = 70$

Ans: A

15 Option: A $x + y = 40, x - y = 8$

Ans: A

01 $1010x + 1011y = 4040$
 $1011x + 1010y = 4044$

$$2021x + 2021y = 8084$$

$$\Rightarrow x + y = 4$$

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

Ans. A, C

02 opt: B : $\frac{3}{2} \neq \frac{4}{-1}$

opt: D : $\frac{1}{1} \neq \frac{1}{-1}$

Ans. B, D

03 Statement I: $\frac{4}{8} = \frac{5}{10} = \frac{20}{40}$

i.e. $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\therefore$ The lines coincide each other

$\Rightarrow$ Infinite solutions

$\Rightarrow$ Consistent (True)

Statement II: Conceptual (True)

Ans. A

04 Statement I: Mother $\rightarrow x$ years
 Son $\rightarrow y$ years

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

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

Solving $\Rightarrow y = 12$ (False)

Statement II: Conceptual (True)

Ans. D

05 $x+y=40, x-y=12$ Ans: A

06 $x+y=40, x-y=12$ (15)
Solving $2x=52 \Rightarrow x=26$ and $y=14$
Large Number = 26 Ans: C

07 option Verification
option: C $x=\frac{1}{24}, y=\frac{7}{24}$ Satisfies the
given equations Ans: C

08 $\frac{1}{2x+y} = m, \frac{1}{3x+y} = n$ Ans: C

09 Assertion: $\frac{2}{4} = \frac{3}{6} = \frac{6}{12} \rightarrow$ Infinite Solution (True)
Reason: Conceptual (True) Ans: A

10 Assertion: $\frac{2}{3} \neq \frac{3}{2} \rightarrow$ Consistent $\rightarrow$ Unique Solution
Reason: True Ans: A

11. $173x + 197y = 149$
 $197x + 173y = 221$
Solving $\Rightarrow x+y=1$ Ans: 1

12 Cows $\rightarrow x$, hens $\rightarrow y$
 $4x+2y=92 \rightarrow$ (1); $x+y=29 \rightarrow$ (2)
Solving $x=17$ Ans: 17

13

$$x + y = 52 \quad (x > y)$$

$$x - y = 8$$

$$x = 30$$

Ans: 30

(16)

$$14 \ a) \ 2x - y + 3 = 0; \ x - 4y = 0$$

$$\Rightarrow \frac{2}{1} \neq \frac{-1}{-4} \Rightarrow \text{Intersecting lines}$$

b) Intercept form

c) parallel lines

$$d) \ \frac{2}{4} = \frac{3}{6} = \frac{6}{12} \Rightarrow \text{Coincident lines}$$

Ans: P, Q, R, S

$$15 \ a) \ x + y = c$$

$$-x - y = -d$$

$$2b = c - d$$

$$\Rightarrow b = \frac{c-d}{2} (b)$$

$$b) \ x + y = 2$$

$$x - y = 3$$

$$\Rightarrow x = \frac{5}{2}, \ y = -\frac{1}{2}$$

$$x^2 + y^2 = \frac{26}{4} = \frac{13}{2} \quad (P)$$

$$c) \ x + y = 0$$

$$x - y = 0$$

$$x = 0, y = 0$$

Not possible (Q)

$$d) \ 3x + 2y = 20 \rightarrow (1) \quad \left. \begin{array}{l} \\ \end{array} \right\} \text{Solving}$$

$$4x - 5y = 42 \rightarrow (2)$$

$$3(a+b) + 2(a-b) = 20; \ 4(a+b) - 5(a-b) = 42$$

$$\text{Solving } b = 5 \quad (r)$$

Ans: b, P, Q, R

 $\Rightarrow$ THE END $\Leftarrow$

10 let 25 paise $\rightarrow x$ (13)
 50 paise $\rightarrow y$
 Rs 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 $\rightarrow x$
 Rs 1 coin $\rightarrow 100 - (x + y)$

Given $25y + 50x + 100(100 - x - y) = 8000$ $\rightarrow (2)$
 paise
 solving (1) + (2) $x + y = 200$
 Ans: B

11. ~~$x + y = 30$ and $2x + y = 7$~~ satisfies the
 $x - 2y = 4 \rightarrow (1)$
 $3x + y = 7 \rightarrow (2)$
 solving $x = \frac{18}{7}$

Ans: —

12 $\left. \begin{array}{l} x + y = 4 \\ 2x + 2y = 8 \end{array} \right\} \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Infinitely many solutions

Ans: C

13 $4x - 5y - 7 = 0$; $3x + 2y - 11 = 0$
 solving $x = 3, y = 1$

Ans: —

14 option: A $x + 3y = 40, x + 6y = 70$

Ans: A

15 option: A $x + y = 40, x - y = 8$

Ans: A