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6. LINEAR EQUATIONS

Class: IX . MATHEMATICS

INTEGRATED⁺ SOLUTIONS

2025/26

TEACHING TASK

JEE MAINS LEVEL

01. $a+b=3 \rightarrow \textcircled{1}$
 $3a+3b=9 \Rightarrow a+b=3 \rightarrow \textcircled{2}$
Consistent

Ans: A

02. $\frac{p}{kp} = \frac{q}{kq} = \frac{r}{kr} \mid \begin{array}{l} px+qy+r=0 \rightarrow \textcircled{1} \\ kpx+kqy+kr=0 \rightarrow \textcircled{2} \end{array}$
 $\Rightarrow \frac{1}{k} = \frac{1}{k} = \frac{1}{k}$
Dependent equations

Ans: A

03. $\frac{4}{q} = \frac{p}{3} = \frac{12}{6} \mid \Rightarrow \begin{array}{l} q=2 \\ p=6 \end{array}$
 $\Rightarrow \frac{4}{q} = \frac{p}{3} = 2$

Ans: B

04. $bx+ay-ab=0 \rightarrow \textcircled{1}$
 $ax+by-ab=0 \rightarrow \textcircled{2}$
Inconsistent $\Rightarrow \frac{b}{a} = \frac{a}{b}$

$$\begin{aligned} \Rightarrow a^2 &= b^2 \\ \Rightarrow a^2 - b^2 &= 0 \\ \Rightarrow (a+b)(a-b) &= 0 \end{aligned}$$

$$\begin{aligned} a+b &= 0 \text{ or } \\ a-b &= 0 \Rightarrow a=b \text{ (False)} \end{aligned}$$

Ans: D

05

$$a + 2b + 3c = 20 \rightarrow (1)$$

(2)

$$2a + 4b + c = 25 \rightarrow (2)$$

$$(1) \times 2 \Rightarrow 2a + 4b + 6c = 40 \rightarrow (3)$$

$$(3) - (2) \Rightarrow 5c = 15 \Rightarrow c = 3$$

Ans. D

06

option verification technique

c) (8, 3)

$$(1) \Rightarrow \frac{11}{8+3} + 2(8-3)$$

$$= \frac{11}{11} + 2(5)$$

$$= 1 + 10$$

$$= 11 \checkmark$$

$$(2) \Rightarrow \frac{22}{8+3} + 3(8-3)$$

$$= \frac{22}{11} + 3(5)$$

$$= 2 + 15$$

$$= 17 \checkmark$$

Ans: C

07.

let the fraction be $\frac{x}{x+8}$

$$\text{Given } \frac{x-1}{(x+8)-1} = \frac{3}{7}$$

$$\Rightarrow 7x - 7 = 3x + 21$$

$$\Rightarrow 4x = 28 \Rightarrow x = 7$$

$$\therefore \text{Fraction} = \frac{7}{15}$$

Ans: C

08

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \Rightarrow \text{Lines coincide} \Rightarrow \text{Infinite solutions}$$

Ans: C



09. Zero solution $\rightarrow$ Lines are parallel (3) Ans. A

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} \Rightarrow \frac{15}{3} = \frac{2}{1} \Rightarrow K = 6$$

10 $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \Rightarrow \frac{p}{4} \neq \frac{3}{p} \Rightarrow p^2 \neq 12$
 $\Rightarrow p \neq \pm 2\sqrt{3}$ Ans. C

JEE ADVANCED LEVEL

11. $px + qy + r = 0 \rightarrow (1)$
 $q x + p y + r = 0 \rightarrow (2)$

$$(1) + (2) \Rightarrow (p+q)x + (p+q)y + 2r = 0$$

$$\Rightarrow (p+q)(x+y) + 2r = 0$$

$$\Rightarrow x+y = \frac{-2r}{p+q}$$

$$\therefore x+y = \begin{cases} \frac{-2r}{p+q} & ; p \neq q \\ -\frac{x}{p} - \frac{r}{q} & p = q \end{cases}$$

Ans: A, B

12. Let the point be $(1, 1)$.
 $\therefore a+b+c=0 \Rightarrow a^3+b^3+c^3=3abc$ Ans: A, B

13. Statement I: Let the No. of Correct question = x
 $\therefore$ No. of Wrong questions = $70 - x$
 $\therefore$ We have $x(1) + (70-x)(-\frac{1}{2}) = 40$
 $\Rightarrow x = 50 \Rightarrow$ Wrong question = 20 (True)

Statement II: Conceptual (True)

Ans. A

14 Statement I:

(4)

$$4x + 5y + 9z = 36 \rightarrow (1)$$

$$6x + \frac{15}{2}y + 11z = 49 \rightarrow (2)$$

$$(1) \times 3 \Rightarrow 12x + 15y + 27z = 108 \rightarrow (3)$$

$$(2) \times 2 \Rightarrow 12x + 15y + 22z = 98 \rightarrow (4)$$

$$(3) - (4) \Rightarrow 5z = 10 \Rightarrow z = 2 \text{ (True)}$$

Statement II: Conceptual (True)

Ans: A

15

$$\frac{2}{3} \neq \frac{-3(2k-1)}{4(k+1)}$$

$$\Rightarrow 8k + 8 \neq -18k + 9$$

$$\Rightarrow 26k \neq 1$$

$$\Rightarrow k \neq \frac{1}{26}$$

$$\therefore k = R - \left\{ \frac{1}{26} \right\}$$

Ans: A

16

$$\frac{3}{4} = \frac{4}{12} = \frac{8}{24} \rightarrow \text{Lines are parallel Coincident}$$

$\rightarrow$ Infinite solutions

Ans: B

17

$$\frac{4}{8} = \frac{5}{10} \Rightarrow \text{Lines are parallel} \Rightarrow \text{No solution}$$

Ans: A

18

$$A) \frac{3}{6} = \frac{-2}{-4} \checkmark$$

$$B) \frac{1}{2} = \frac{1}{2} \checkmark$$

$$C) \frac{2}{8} = \frac{-4}{-16} \checkmark$$

D) ..

Ans: D

19) please, discard this question as it has insufficient data to solve. (5)

20. $\frac{x+1}{y-1} \geq 1 \Rightarrow x-y = -2 \rightarrow (1)$
 $\frac{x}{y+1} = \frac{1}{2} \Rightarrow 2x-y = 1 \rightarrow (2)$

Solving (1) & (2) $\Rightarrow x = 3, y = 5$
 $\therefore \text{Sum} = x+y = 3+5 = 8$

Ans: 8

21 i) $\begin{cases} 2x+3y=19 \\ 5x+4y=37 \end{cases} \Rightarrow (x,y) = (5,3) (t)$

ii) $\begin{cases} 4x-3y=32 \\ x+y=1 \end{cases} \Rightarrow (x,y) = (5,-4) (s)$

iii) $\begin{cases} 4x+5y=71 \\ 5x+3y=66 \end{cases} \Rightarrow (x,y) = (9,7) (r)$

iv) $\begin{cases} 5x+6y=30 \\ 10x+12y=40 \end{cases} \Rightarrow (x,y) = \text{No Solution}$
 $\text{Since } \frac{5}{10} \neq \frac{6}{12} \text{ (parallel lines)}$
 Ans. t, s, r, p

22 i) $\frac{1}{1} \neq \frac{-1}{1} \Rightarrow \text{Unique solution, consistent } (P, r)$

ii) $\frac{1}{1} \neq \frac{-3}{-2} \Rightarrow \text{Unique solution, consistent } (P, s)$

iii) $\frac{1}{2} = \frac{-1}{-2} = \frac{7}{14} \Rightarrow \text{Infinitely many solution, inconsistent } (Q) (P, s)$

iv) $\frac{1}{2} = \frac{-2}{-4} \Rightarrow \text{Inconsistent } (Q)$

Ans: $(P, r), (P, s), (Q), (Q)$

LEARNERS TASK (CUES)

⑥

01.	1	Ans. A
02.	Conceptual	Ans. D
03.	Conceptual	Ans. A
04.	Conceptual	Ans. B
05.	Conceptual	Ans. D
06.	Conceptual	Ans. B
07.	Conceptual	Ans. C
08.	Conceptual	Ans. D
09.	Conceptual	Ans. A
10.	Conceptual	Ans. B

JEE MAINS LEVEL

01. let the No. of unattempted questions = x
 ,, Correct question = y
 ,, Wrong questions = $100 - (x+y)$

case (i) $2(y) + (-\frac{1}{2})[100 - (x+y)] + (-\frac{1}{2})x = 135 \rightarrow \textcircled{1}$

case (ii) $2(y) + (-\frac{1}{2})[100 - (x+y)] + (-1)x = 133 \rightarrow \textcircled{2}$

Solving $\textcircled{1}$ & $\textcircled{2} \Rightarrow x = 14$

Ans: A



02. Let $a_1=1, b_1=2, c_1=3, a_2=4, b_2=5, c_3=6$

$\therefore x+2y+3=0 \rightarrow (1)$

$4x+5y+6=0 \rightarrow (2)$

Solving $(x,y) = (1,-2)$

Ans: A



Q3

$$99x + 101y = 400 \rightarrow (1)$$

$$101x + 99y = 600 \rightarrow (2)$$

$$(1) + (2) \Rightarrow 200x + 200y = 1000$$

$$\Rightarrow x + y = 5$$

Ans. D

Q4

$$\frac{1}{x} + \frac{1}{y} = k \rightarrow (1)$$

$$\frac{1}{x} - \frac{1}{y} = k \rightarrow (2)$$

$$\frac{2}{y} = 0 \Rightarrow y = \text{does not exist}$$

Ans. D

Q5

$$3a + 2b + 4c = 26 \rightarrow (1)$$

$$4a + 6b + 2c = 48 \rightarrow (2)$$

$$\Rightarrow 2a + 3b + c = 24 \rightarrow (3)$$

$$(1) + (3) \Rightarrow 5a + 5b + 5c = 50$$

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

Ans: B

Q6

Option Verification technique

Option: C $x = \frac{1}{2}, y = \frac{1}{4}, z = \frac{1}{3}$

$$\left. \begin{array}{l} \frac{1}{x} + \frac{1}{y} = 6 \\ \Rightarrow 2 + 4 = 6 \checkmark \end{array} \right\} \begin{array}{l} \frac{1}{y} + \frac{1}{z} = 7 \\ \Rightarrow 4 + 3 = 7 \end{array} \right\} \begin{array}{l} \frac{1}{z} + \frac{1}{x} = 5 \\ \Rightarrow 3 + 2 = 5 \checkmark \end{array}$$

: Ans: C



07. Given $3|x| + 5|y| = 8$

(9)

$$7|x| - 3|y| = 48$$

Let $|x| = a$ and $|y| = b$

$$\therefore 3a + 5b = 8 \rightarrow (1)$$

$$7a - 3b = 48 \rightarrow (2)$$

Solving (1) & (2) $\Rightarrow a = 6, b = -2$

$$\therefore |x| = 6 \quad |y| = -2$$

$$\Rightarrow x = \pm 6 \quad \text{which is not possible}$$

$$\therefore x+y \rightarrow \text{not possible}$$

Ans: —

08 According to given data

$$3b = a + c + d \rightarrow (1)$$

$$4c = a + b + d \rightarrow (2)$$

$$5d = a + b + c \rightarrow (3)$$

Let $a + b + c + d = S$

$$(1) \Rightarrow 3b + b = a + b + c + d = S$$

$$\Rightarrow 4b = S \Rightarrow \boxed{b = \frac{S}{4}}$$

Similarly $\Rightarrow (2) \Rightarrow 5c = S \Rightarrow \boxed{c = \frac{S}{5}}$

$$(3) \Rightarrow 6d = S \Rightarrow \boxed{d = \frac{S}{6}}$$

Now $a + b + c + d = S$

$$\Rightarrow a + \frac{S}{4} + \frac{S}{5} + \frac{S}{6} = S$$

$$\Rightarrow \boxed{a = \frac{23S}{60}} \Rightarrow \boxed{a = \frac{S}{\left(\frac{60}{23}\right)}}$$



Clearly A gets the largest share $\left(\frac{60}{23} \sim 2\right)$ (10)
D gets the smallest share

$$\text{Given } A + D = 99$$

$$\Rightarrow \frac{23S}{60} + \frac{S}{6} = 99$$

$$\Rightarrow \frac{34S}{60} = 99$$

$$\therefore S = 180.$$

$$\begin{aligned}\text{Sum of other two shares} &= 180 - 99 \\ &= 81\end{aligned}$$

Ans: B

09. Given 3 digit number abc

$$\therefore abc = 100a + 10b + c$$

According to the problem

$$abc = (a + b + c) + 459$$

$$\Rightarrow 100a + 10b + c = (a + b + c) + 459$$

$$\Rightarrow 11a + b = 51$$

$$\Rightarrow (10a + b) + a = 51$$

$\downarrow$
two digit number ab / one-digit number a

$$\Rightarrow \text{Hence the answer} = 51$$

Ans: C

(11)

$$10 \quad m + ny + a + b = a - b$$

$$\Rightarrow mx + ny + 2b = 0 \rightarrow (1)$$

$$\Rightarrow nx + my + 2b = 0 \rightarrow (2)$$

$$(1) - (2) \Rightarrow (m - n)(x - y) = 0$$

$$\Rightarrow x - y = 0 \quad \text{Since } x \neq y$$

$$\Rightarrow x = y$$

$$\Rightarrow \sin \theta = \cos \theta \Rightarrow \theta = 45^\circ \quad \text{Ans: B}$$

$$11 \quad \frac{12}{2x+3y} + \frac{5}{3x-2y} = -7 \quad \text{and} \quad \frac{8}{2x+3y} + \frac{6}{3x-2y} = -10$$

$$\text{Let } \frac{1}{2x+3y} = a, \quad \frac{1}{3x-2y} = b$$

$$\therefore 12a + 5b + 7 = 0 \rightarrow (1)$$

$$8a + 6b + 10 = 0 \rightarrow (2)$$

$$\text{Solving } a = \frac{1}{4}, \quad b = -2$$

$$\Rightarrow \frac{1}{2x+3y} = \frac{1}{4}, \quad \frac{1}{3x-2y} = -2$$

$$\Rightarrow 2x + 3y - 4 = 0 \quad 6x + 4y + 1 = 0$$

$$\text{Solving } x = \frac{1}{2}, \quad y = 1$$

Ans: A, B

12. Please, change the question as

(12)

$$\frac{x}{a} + \frac{y}{b} = a+b ; \quad \frac{x}{a^2} + \frac{y}{b^2} = 2$$

Clearly $x=a^2$, $y=b^2$ satisfies the above equations

Ans: A, C

13 Statement I:

$$2x + 3y = 1$$

$$(3k-1)x + (1-2k)y = 2k+3$$

$$\text{No solution} \Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2}$$

$$\Rightarrow \frac{3k-1}{2} = \frac{1-2k}{3}$$

$$\Rightarrow 9k-3 = 2-4k$$

$$\Rightarrow 13k = 5$$

$$\Rightarrow k = \frac{5}{13} \text{ (True)}$$

Statement II: Conceptual (True)

Ans: A

14 Statement I:

$$\frac{3(k-1)}{15} = \frac{4}{20}$$

$$\Rightarrow k = 2 \text{ (False)}$$

Statement II: Conceptual (True)

Ans: D



15 $ax + by + (t-s) = 0$; $bx + ay + (s-r) = 0$ (13)

$(P, P) \Rightarrow ap + bp + t - s = 0 \rightarrow (1)$

$(P, P) \Rightarrow bp + ap + s - r = 0 \rightarrow (2)$

$(1) + (2) \Rightarrow 2(a+b)p + t - r = 0$

$\Rightarrow 2[s-t] + t - r = 0$

$\Rightarrow 2s - 2t + t - r = 0$

$\Rightarrow 2s = t + r$

Form (1)

$(a+b)p = s-t$

Ans: C

Q6 option verification

option: D $(2, -1)$

$173x + 197y$
 $= 173(2) + 197(-1)$
 $= 346 - 197$
 $= 149 \checkmark$

$197x + 173y$
 $= 197(2) + 173(-1)$
 $= 394 - 173$
 $= 221 \checkmark$

Ans: $(2, -1)$ D

17 $\frac{2}{-4} = \frac{-3}{q} \neq \frac{3}{(\frac{p}{q})}$

$\Rightarrow \boxed{q = 6} \quad \boxed{p \neq -36}$

Ans: D

18 $\frac{4}{11K-3} = \frac{-(3K+2)}{-10} = \frac{20}{40}$

$\Rightarrow K = 1$

Ans: D



$$19. \quad b = \frac{3}{10} \times 20 = 6$$

Ans: 6

(14)

$$20 \quad \frac{5}{10} = \frac{4}{8} = \frac{6}{-12}$$

$$\Rightarrow \frac{1}{2} = \frac{1}{2} \neq -\frac{1}{2} \quad (\text{parallel lines})$$

No solution

Ans: 0

$$21 \quad i) \quad x = 8 \quad (t)$$

$$ii) \quad (x, y) = (9, 7) \quad (p)$$

$$(iii) \quad (x, y) = (\text{Infinite solution})$$

$$\text{Since } \frac{3}{9} = \frac{4}{12} = \frac{8}{24} \quad (x)$$

$$(iv) \quad (x, y) \Rightarrow \frac{5}{10} = \frac{6}{12} \neq \frac{30}{40}$$

No solution
(No solution)

Ans: $t, p, x, -$

$$22 \quad i) \quad (u, v) = (1, \frac{1}{2}) \quad (x)$$

$$ii) \quad \left. \begin{aligned} 4(2x-1) + 9(3y-1) &= 30 \\ 3(2x) - 2(3y) &= 6 \end{aligned} \right\} (x, y) = (2, 1)$$

$$(iii) \quad 3(a+b) + 2(a-b) = 20 \Rightarrow 5a + b = 20$$

$$4(a+b) - 5(a-b) = 42 \Rightarrow -a + 9b = 42$$

$$a = 3, \quad b = 5 \quad (9)$$

$$\text{Solving} \quad x - y = 3$$

Ans: $x, -y, 3$

$\Rightarrow \text{THE END} \Leftarrow$