



Sahi Prep Hai Toh Life Set Hai

LINEAR EQUATION

STRUCTURE OF COMPLETE ALGEBRA

- | | | |
|----------------------------------|---|------------------|
| 1. Linear Equation | - | 1 Class |
| 2. Quadratic Equation | - | 1 Class |
| 3. Simplification | - | 2 Classes |
| 4. Algebraic Formulas | - | <u>3 Classes</u> |
| 5. AP/GP | - | <u>1 Class</u> |
| 6. Special Series | - | <u>1 Class</u> |

Doubt Session

For Basic
NCERT $\rightarrow 8^{\text{th}} | 10^{\text{th}}$

NCERT $\rightarrow 10^{\text{th}}$

NCERT $\rightarrow 9^{\text{th}}$

NCERT $\rightarrow 9^{\text{th}}$

Refer only class

Refer only class

1 class

Linear Equation

Equation " = "

linear \rightarrow Degree = 1
 \downarrow
Highest Power of any variable

eg $x + 2 = 5$ Degree = 1
 $x^2 + 3x + 4 = 0$ Degree = 2

Degree = 1
 Degree = 2
 Degree = 3
 Degree = 4

linear
 Quadratic
 Cubic
 Biquadratic

eg

$$3x + 8 = 0$$

linear equation
in 1 variable

eg

$$x^2 + 5x + 8 = 0$$

Quadratic eqⁿ in 1

eg

$$2x + 3y = 8$$

linear eqⁿ in 2 variables

eg

$$3x + 4y$$

linear expression

$\left\{ \begin{array}{l} \rightarrow \text{linear eq}^n \text{ in } 1, 2, 3 \text{ variables} \\ \rightarrow \text{Quadratic in } 1 \text{ variable} \\ \rightarrow \text{Basics of cubic} \end{array} \right.$

linear eqⁿ in 1 variable

* we take all variables on one side & constant on other side

$$\begin{array}{ccc}
 + & = & - \\
 1 & 1 & 1 \\
 x & 1 & + 1 \cdot x
 \end{array}$$

$$\text{Eg1.: } 4(x+5) = \frac{3x}{5} + 2(2x-3)$$

$$4(x+5) = \frac{3x}{5} + 2(2x-3)$$

$$4x + 20 = \frac{3x}{5} + 4x - 6$$

$$26 = \frac{3x}{5}$$

$$x = \frac{130}{3} \Rightarrow 43\frac{1}{3}$$

- ① Make coeff of x or y equal
- ② Cancel that variable whose coeff you have made same

Eg2.

$$8x + 5y = 9$$

$\times 2$

$$3x + 2y = 4$$

$\times 5$

$$16x + 10y = 18 \quad \text{--- ①}$$

$$15x + 10y = 20 \quad \text{--- ②}$$

$$\boxed{x = -2}$$

$$3x + 2y = 4$$

$$3(-2) + 2y = 4$$

$$y = 5$$

Eg3.

$$5x + 2y = 19$$

$\times 3$

$$4x - 3y = 6$$

$\times 2$

$$15x + 6y = 57$$

$$8x - 6y = 12$$

$$23x = 69$$

$$x = 3$$

$$15 + 2y = 19$$

$$y = 2$$

eg $5x - 2y = 8 \quad \times 3$ Find x & y

$$3x + 11y = 17 \quad \times 5$$

$$15x - 6y = 24$$

$$\begin{array}{r} 15x + 55y = 85 \\ \hline \end{array}$$

$$-61y = -61$$

$$5x = 10$$

$$\boxed{x = 2}$$

$$y = 1$$

eg

$$37x + 58y = 248 \quad - (1)$$

$$58x + 37y = 227 \quad - (2)$$

Find x & y

Add (1) & (2)

$$95x + 95y = 475$$

$$\boxed{x + y = 5} \quad \checkmark$$

(2) - (1)

$$21x - 21y = -21$$

$$\boxed{x - y = -1} \quad \checkmark$$

$$\begin{array}{l} x + y = 5 \\ x - y = -1 \\ \hline x = 2 \\ y = 3 \end{array}$$

Equations of the form $ax + by = c$ and $bx + ay = d$ where $a \neq b$.

To solve the above type of equations, following algorithm may be used:

ALGORITHM

Step I : Obtain the two equations.

Let the equation be $ax + by = c$ and $bx + ay = d$

Step II : Adding and subtracting the two equations, we obtain

$$(a + b)x + (a + b)y = c + d \Rightarrow x + y = \frac{c + d}{a + b} \quad \text{.....(i)}$$

$$(a - b)x - (a - b)y = c - d \Rightarrow x - y = \frac{c - d}{a - b} \quad \text{.....(ii)}$$

Step III : Add and subtract equations (i) and (ii) to get the values of x and y .

Eg6.

$$\begin{array}{rcl} 217x + 131y = 913 & - & \textcircled{1} \\ 131x + 217y = 827 & - & \textcircled{2} \end{array}$$

$$\textcircled{1} + \textcircled{2}$$

$$348(x+y) = 1740$$

$$\boxed{x+y=5}$$

$$\textcircled{1} - \textcircled{2}$$

$$86(x-y) = 86$$

$$\boxed{x-y=1}$$

$$\begin{array}{l} x=3 \\ y=2 \end{array}$$

$$\begin{array}{r} 12x + 9y + 6z = 12 \\ 4x - 8y + 6z = -30 \\ \hline \end{array}$$

$$8x + 17y = 42$$

$$\begin{array}{r} 8x + 6y + 4z = 8 \\ 3x + 5y - 4z = 25 \\ \hline \end{array}$$

$$11x + 11y = 33$$

$$x + y = 3$$

Eg7.

$$\left. \begin{array}{l} 4x + 3y + 2z = 4 \\ 2x - 4y + 3z = -15 \\ 3x + 5y - 4z = 25 \end{array} \right\} \begin{array}{l} \text{--- (1)} \\ \text{--- (2)} \\ \text{--- (3)} \end{array}$$

$$\left. \begin{array}{l} 8x + 17y = 42 \\ x + y = 3 \end{array} \right\}$$

$$x = 1 \quad y = 2$$

$$4 + 6 + 2z = 4$$

$$z = -3$$

Eg8.

$$5x - 3y + 4z = 4$$

$$4x + 5y - 7z = 5$$

$$2x + y + 3z = 11$$

$$5x - 3y + 4z = 4$$

$$6x + 3y + 9z = 33$$

$$11x + 13z = 37$$

$$4x + 5y - 7z = 5$$

$$10x + 5y + 15z = 55$$

$$+ 6x + 22z = +50$$

$$3x + 11z = 25$$

$$x = 1$$

$$z = 2$$

$$2 + y + 3 \cdot 2 = 11$$

$$y = 3$$

Eg9.

$$3x + 4y + 5z = 22$$

$$4x + 5y + 6z = 28$$

Find the values of x, y & z

Can't be determined

Because there are 3 variables &
only 2 equations, so we can't
solve values of x, y & z



If there are three variables, then we need three independent equations to solve all the three variables.

$$6x + 8y + 10z = 44$$

$$3x + 4y + 5z = 22$$

Eg10.

$$3x + 4y + 5z = 22 \quad - \quad (1)$$

$$4x + 5y + 6z = 28 \quad - \quad (2)$$

$$2x + 3y + 4z = 16 \quad - \quad (3)$$

Find the values of x , y and z .

These are not 3 independent

eqⁿ so we can't solve x, y & z

3 independent equation & 3 variables

→ We can solve them

2 independent eqⁿs & 3 variables

(i) We can't solve all the 3
variable

(ii) We can solve certain expression
involving 3 variable

$$\left. \begin{aligned} 5K_1 + 8K_2 &= 9 \\ 4K_1 + 7K_2 &= 6 \end{aligned} \right\}$$

$$K_1 = 5 \quad K_2 = -2$$

Just check coeff of z

$$7 \times 5 + 9 \times -2 = 17$$

If it matches
you can solve

Eg11.

$$\begin{aligned} 5x + 4y + 7z &= 250 & - \textcircled{1} K_1 \\ 8x + 7y + 9z &= 400 & - \textcircled{2} K_2 \\ \underline{9x + 6y + 17z} &= ?? \end{aligned}$$

$$250 \times 5 + 400 \times (-2)$$

$$1250 - 800 =$$

$$450$$

$$5k_1 + 8k_2 = 9$$

$$4k_1 + 7k_2 = 6$$

$$k_1 = 5 \quad k_2 = -2$$

check coeff of z

$$25 + 9(-2) = 17$$

Eg12.

$$5x + 4y + 7z = 250$$

$$8x + 7y + 9z = 400$$

$$9x + 6y + \underline{18z} = ??$$

— (1) $\times k_1$

— (2) $\times k_2$



Can't be
determined



If there are three variables and we are given two equations, then the unknown expression may or may not be solved, it totally depends on that expressions.

Can't be determined

Eg.

$$3 \text{ erasers} + 5 \text{ pens} + 2 \text{ pencils} = \text{Rs. } 29 \quad \times K_1$$

$$5 \text{ erasers} + 3 \text{ pens} + 4 \text{ pencils} = \text{Rs. } 35 \quad \times K_2$$

Find the cost of 6 erasers + 26 pens + 2 pencils = ??

$$3K_1 + 5K_2 = 6$$

$$5K_1 + 3K_2 = 26$$

$$K_1 = 7 \quad K_2 = -3$$

$$2 \times 7 + 4 \times (-3) \\ = \textcircled{2}$$

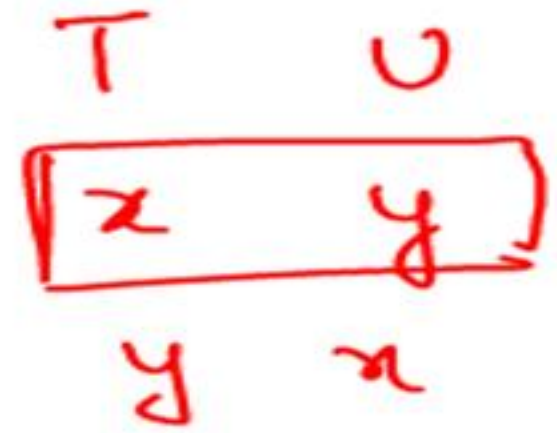
$$29 \times 7 + 35 \times -3$$

$$203 - 105$$

$$= \textcircled{98}$$

LINEAR EQUATIONS : WORD PROBLEMS

2 digit number \longrightarrow
reversed



Number formed $\longrightarrow 10x + y$

Reversed Number $\longrightarrow 10y + x$

$$\begin{array}{r} xy \\ + yx \\ \hline \text{multiple of } 11 \end{array}$$

$$\begin{array}{r} \underline{10x+y} \\ \underline{10y+x} \\ \hline 11(x+y) \end{array}$$

$$\begin{array}{r} xy \\ - yx \\ \hline \text{multiple of } 9 \end{array}$$

$$\begin{array}{r} (10x+y) \\ - (10y+x) \\ \hline 9(x-y) \end{array}$$

$$\begin{array}{r}
 ab \quad 10a + b \\
 ba \quad 10b + a \\
 \hline
 11(a + b)
 \end{array}$$

Eg1. A number consists of two digits. If the number formed by interchanging the digits is added to the original number, the resulting number (i.e., the sum) must be divisible by.

- ~~(a) 11~~ (b) 9
 (c) 5 (d) 3

PYQ of SSC

$$\begin{array}{r} ab \\ - ba \\ \hline \\ \hline \end{array}$$

Eg2. The difference of a number consisting of two digits from the number formed by interchanging the digits is always divisible by:

- (a) 10
(c) 11

- ☒ (b) 9
(d) 6

$$\rightarrow 100a + 10b + c$$

c b a

$$\rightarrow \log c + \log b + a$$

(-)

multi ple of 99

57

११९ - ११८

$$99(a-c)$$

$$\begin{array}{r}
 a \ b \ c \\
 + \ c \ b \ a \\
 \hline \\
 \hline
 \end{array}$$

$$100a + 10b + c$$

$$\begin{array}{r}
 100c + 10b + a \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 101a + 20b + 101c \\
 \hline
 \downarrow
 \end{array}$$

Nothing can be
taken common

I Option

Ans (c)

✓

Eg4. The sum of the digits of a two digit number is 10. The number formed by reversing the digit is 18 less than the original number. Find the original number.

(a) 81 ✗

(b) 46 ✗

✓ (c) 64

(d) 60 ✗

Tip

Detailed App

T U

a b

Original

$10a + b$

Reverse

$10b + a$

$$\frac{10b + a}{9(a - b) = 18}$$

$$a + b = 10$$

$$\frac{a - b = 2}{\text{---}}$$

$$a = 6$$

$$b = 4$$

(64)

Ist

Option

IInd

Detailed App

Eg5. In a two-digit number, the digit at the unit's place is 1 less than twice the digit at the ten's place. If the digits at unit's and ten's place are interchanged the difference between the new and the original number is less than the original number by 20. The original number is:

47

T
x

U
2x-1

(a) 59 ✗
(c) 35 ✗

(b) 23 ✗
(d) 47 ✓

Original no →

$$10x + 1(2x-1) = 12x-1$$

Reversed no →

$$10(2x-1) + 1 \cdot x = 21x-10$$

$$(21x-10) - (12x-1) = 12x-1 - 20$$

$$9x-9 = 12x-21 \quad \boxed{x=4}$$