CLASS – 10

MATHEMATICS

Chapter – 3

Pair of Linear Equations in Two Variables

Part – 4

Substitution Method

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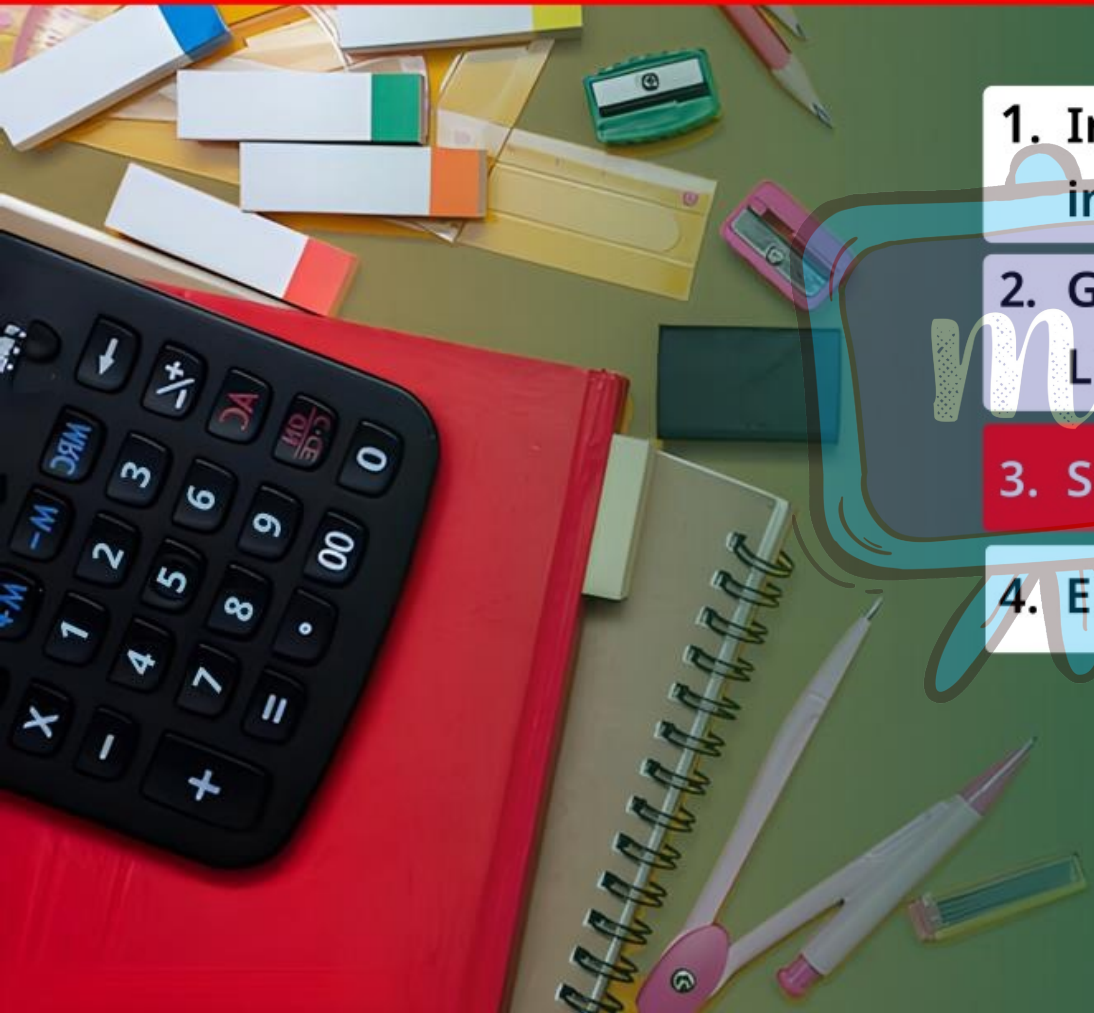
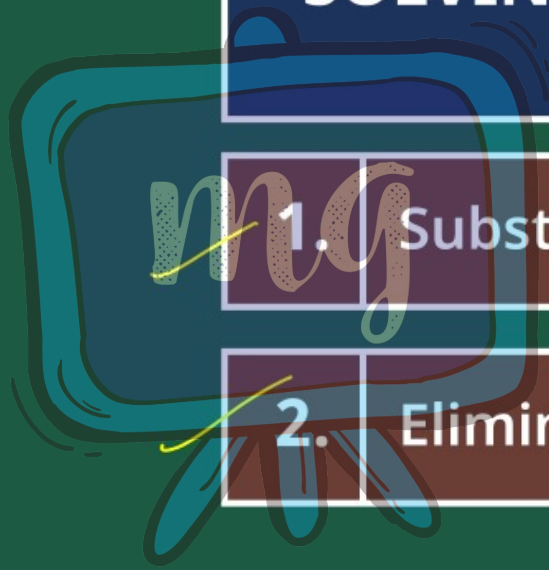
OVERVIEW



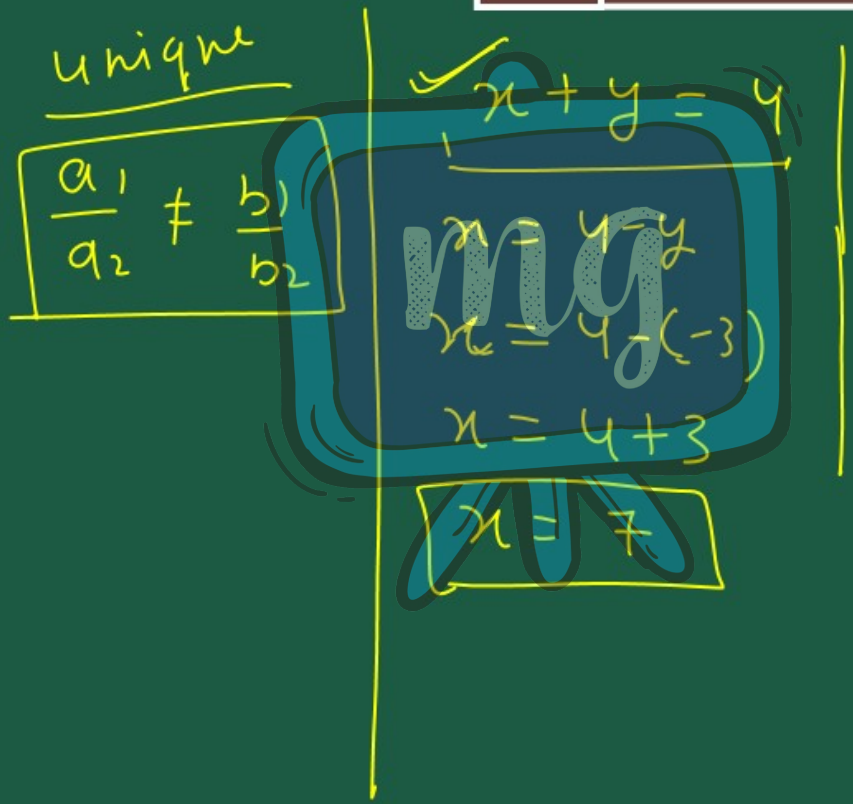
1. Introduction to Pair of Linear Equations in Two Variables
2. Graphical Method of Solution of a Pair of Linear Equations
3. Substitution Method
4. Elimination Method

ALGEBRAIC METHODS OF SOLVING A PAIR OF LINEAR EQUATIONS



1. Substitution Method
2. Elimination Method

1. SUBSTITUTION METHOD



$2x + 3y = 5$

$2(4 - y) + 3y = 5$

$8 - 2y + 3y = 5$

$8 + y = 5$

$y = 5 - 8$

$y = -3$

Example : 4

Solve the following pair of equations by substitution method:

$7x - 15y = 2$ — (1)

$x + 2y = 3$ — (2)

From the eq. $x = 3 - 2y$ — (3)

By placing the value of x from eq (3) to eq (1)

$7x - 15y = 2$

$7(3-2y) - 15y = 2$

$21 - 14y - 15y = 2$

$-29y = 2 - 21$

$-29y = -19$

$y = \frac{+19}{+29} = \frac{19}{29}$ — (4)

For eq (3) & eq (4)

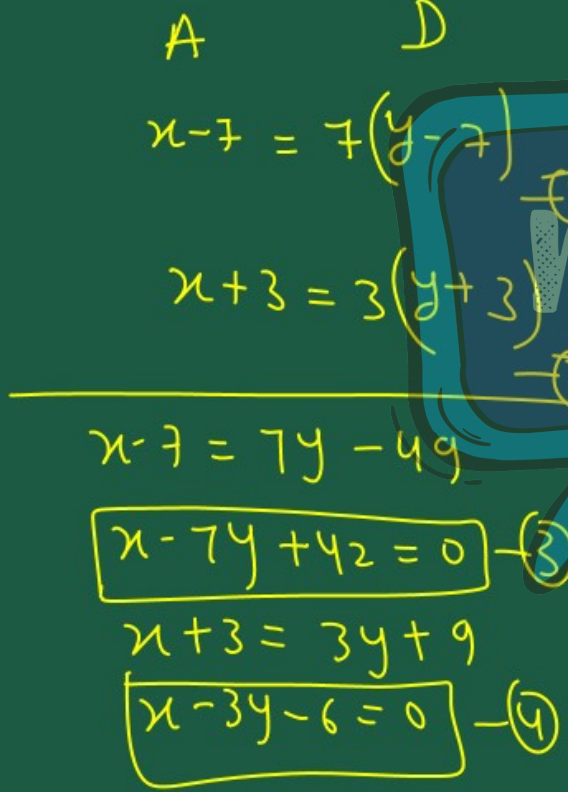
$x = 3 - 2\left(\frac{19}{29}\right)$

$x = 3 - \frac{38}{29}$

$= \frac{87 - 38}{29}$

$x = \frac{49}{29}$ ✓

Example : 5



Solve the following question – Aftab tells his daughter, "Seven years ago, I was seven times as old as you were then. Also, three years from now, I shall be three times as old as you will be." (Isn't this interesting?) Represent this situation algebraically and graphically by the method of substitution.

$x - 7y + 42 = 0$ | $x - 3y - 6 = 0$

$x = -42 + 7y$ — (5)

By substituting the value of x into eq. (4)

$-42 + 7y - 3y - 6 = 0$

$-42 + 4y - 6 = 0$

$4y = 48$

$y = 12$ year.

By placing the value of y in the eq. (5)

$x = -42 + 7(12)$

$x = -42 + 84$

$x = 42$ year.

Hence the ages of A Ftab and his daughter are 42 and 12 years respectively.

$x - 7y + 42 = 0$

$x = -42 + 7y$

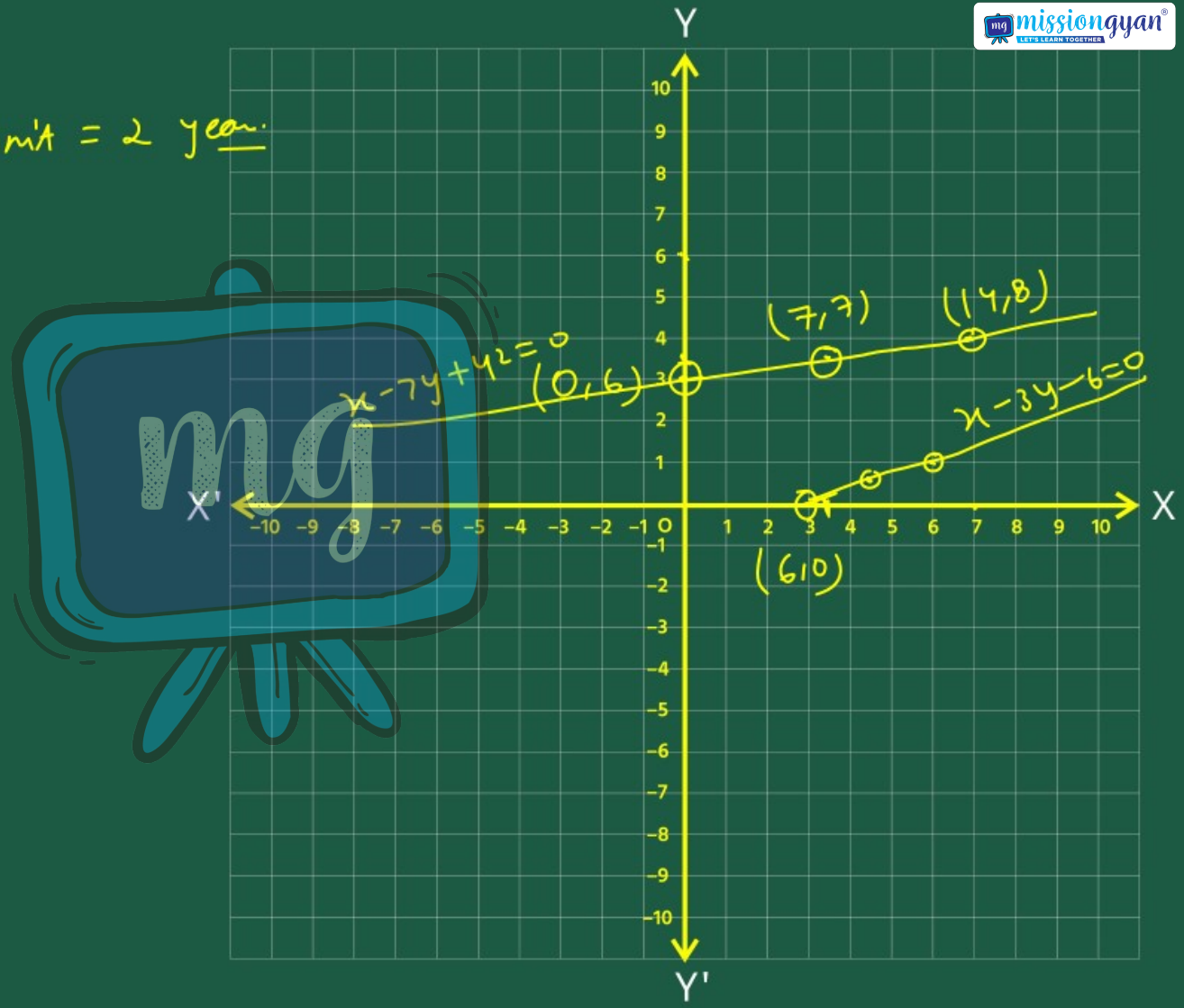
x	0	7	14
y	6	7	8

$x - 3y - 6 = 0$

$x = 3y + 6$

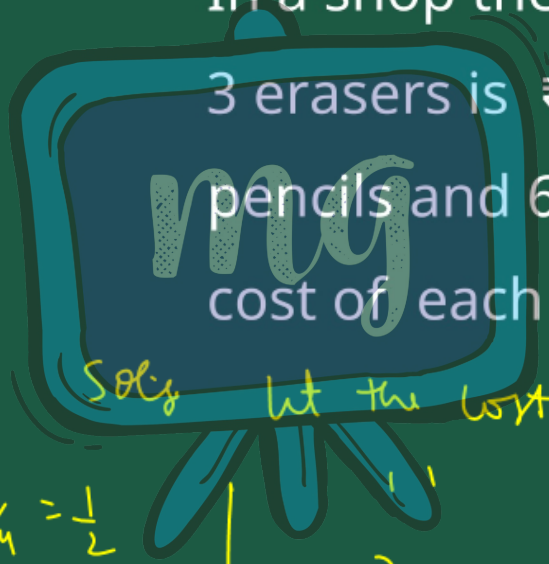
x	6	9	12
y	0	1	2

1 unit = 2 years



Example : 6

In a shop the cost of 2 pencils and 3 erasers is ₹ 9 and the cost of 4 pencils and 6 erasers is ₹ 18. Find the cost of each pencil and each erasers.



Sol: Let the cost of one pencil is x

" " " eraser is y

$2x + 3y = 9$

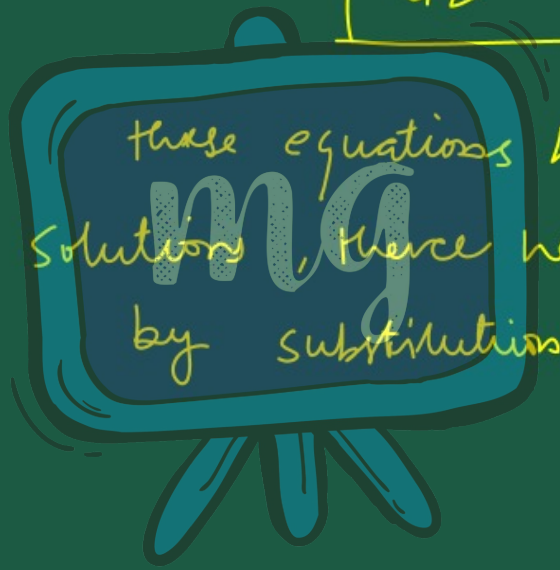
$4x + 6y = 18$

$\frac{a_1}{a_2} = \frac{2}{4} = \frac{1}{2}$

$\frac{b_1}{b_2} = \frac{3}{6} = \frac{1}{2}$

$\frac{c_1}{c_2} = \frac{9}{18} = \frac{1}{2}$

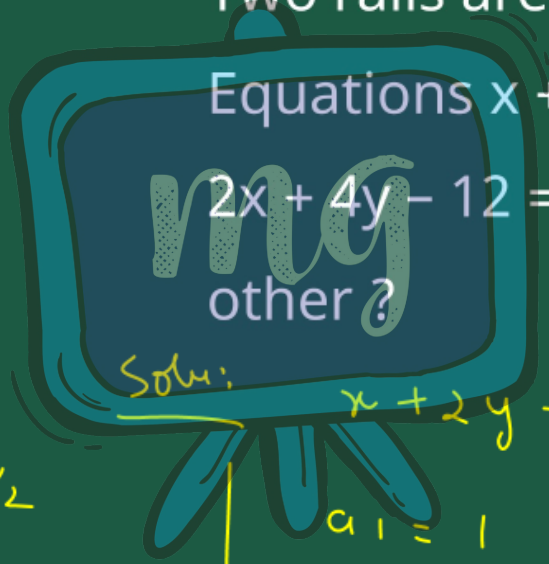
as $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$



these equations has infinitely many solutions, therefore we can't solve them by substitution method

Example : 7

Two rails are represented by the Equations $x + 2y - 4 = 0$ and $2x + 4y - 12 = 0$. Will the rails cross each other ?



Solu:

$x + 2y - 4 = 0$ | $2x + 4y - 12 = 0$

$a_1 = 1$, $b_1 = 2$, $c_1 = -4$

$a_2 = 2$, $b_2 = 4$, $c_2 = -12$

$\frac{a_1}{a_2} = \frac{1}{2}$

$\frac{b_1}{b_2} = \frac{2}{4} = \frac{1}{2}$

$\frac{c_1}{c_2} = \frac{-4}{(-12)} = \frac{1}{3}$

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

Here this will shows the pattern of Parallel lines. Therefore they will not cross each other.

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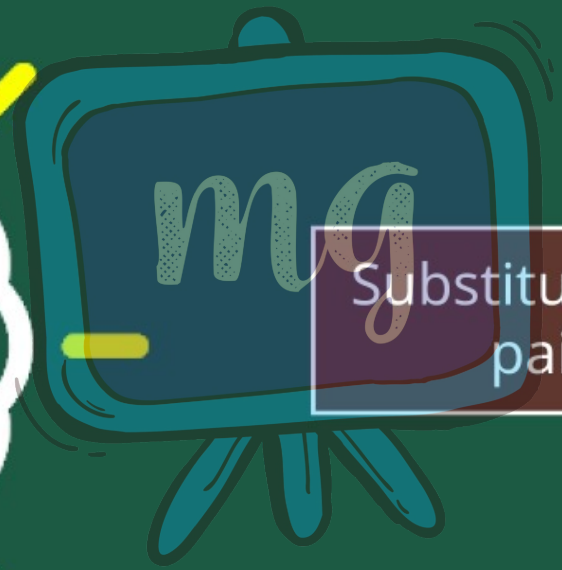

Substitution method of solving a pair of linear equation

ASSESSMENT

1

The father's age is six times his son's age. Four year hence, the age of the father will be four times his son's age. The present ages of the son and the father are, respectively.

A 4 and 24

B 5 and 30

C 6 and 36

D 3 and 24