UNIK PIPE FITTINGS UNIK+ VALVES
Largest Pipe Fittings Group of India

Chapter - 2
Equations

- Mathematical statement of equality.

For eg: $2x - 9 = 7$
$2x = 9 + 7$
$2x = 16$
$x = 8$

Solution of equation
[By putting we will get L.H.S = R.H.S]

> Solution /root : The value of variable (say x) that satisfies a given equation.

> Degree : The highest power of variable in a given equation

Shreya Sharma

For eg:

$$\underbrace{x^2}_{\text{Highest power}} + 2x + 3 = 0$$

So degree = 2

Simple equation:

> Equation of one degree and having an unknown variable is simple.

> A simple equation has only one real.

Form of equation.

$$\underbrace{a}_{\text{Coeff of } x}x + \underbrace{b}_{\text{Constant}} = 0$$

$[a \neq 0]$

Shreya Sharma

$3x - 5 = 19$

$a = 3$
$b = -5-19$
$= -24$

$\left[3x - \underbrace{5-19}_{b} = 0 \right.$

Simultaneous linear equations :-

→ Deals with 2 unknown equations.

Form :-

$a_1 x + b_1 y + c_1 = 0$

$a_2 x + b_2 y + c_2 = 0$

where,

a is coefficient of x
b is coefficient of y
c is constant
$a \neq 0$

Take a example

$2x + 3y = 10$
$3x - 4y - 10 = 14$

Shreya Sharma

So $2x + 3y - 10 = 0$
$3x - 4y - 10 - 14 = 0$

1. $a = 2$, $b = 3$, $c = -10$
2. $a = 3$, $b = -4$, $c = -24$

Methods of solution (Two Unknown)

1. Elimination method :-

suppose there are two equation

$2x + 5y = 9$ and $3x - y = 5$

$$2x + 5y = 9$$
$$3x - y = 5$$

Multiply 5 in eq (ii)

$$15 - 5y = 25$$

Add eq (i) and (ii)

$$2x + \cancel{5y} = 9$$
$$15x - \cancel{5y} = 25$$
$$17x = 34$$

$x = \frac{34}{17} = 2$

Shreya Sharma

UNIK PIPE FITTINGS UNIK+ VALVES
Largest Pipe Fittings Group of India

Put value of x in eq 1

$$2x + 5y = 9$$
$$2 \times 2 + 5y = 9$$
$$4 + 5y = 9$$
$$5y = 9 - 4$$
$$5y = 5$$
$$y = \frac{5}{5}$$
$$y = 1$$

Substitution method :-

1. $2x + 5y = 9$ —— (1)
2. $3x - y = 5$ —— (2)

$$y = 3x - 5$$

Put value of y in 1

$$2x + 5y = 9$$
$$2x + 5(3x - 5) = 9$$

$$2x + 15x - 25 = 9$$
$$17x = 34$$
$$x = 2$$

Shreya Sharma

sub value of x in eq(ii)

$$y = 3x - 5$$
$$y = 3 \times 2 - 5$$
$$y = 1$$

☆ Cross multiplication method :-
(Not mandatory)

Formula based method

$$a_1 x + b_1 y + c_1 = 0$$
$$a_2 x + b_2 y + c_2 = 0$$

$$\frac{x}{b_1 c_2 - b_2 c_1} = \frac{y}{c_1 a_2 - c_2 a_1} = \frac{1}{a_1 b_2 - a_2 b_1}$$

Quadratic equation :-

> Equations having degree 2 is called as quadratic equation.

> QE will have two roots / solutions usually denoted by α, β.

Shreya Sharma

UNIK PIPE FITTINGS UNIK+ VALVES
Largest Pipe Fittings Group of India

Equation format :-

$$ax^2 + bx + c = 0$$

a — Coeff of x^2

b — Coeff. of x

c — Constant

$(a \neq 0$

for eg: $x^2 - 2x + 8 = 10$

$a = 1$, $b = -2$, $c = 8 - 10 = -2$

How to calculate :-

Methods :-

Trial and error method :-

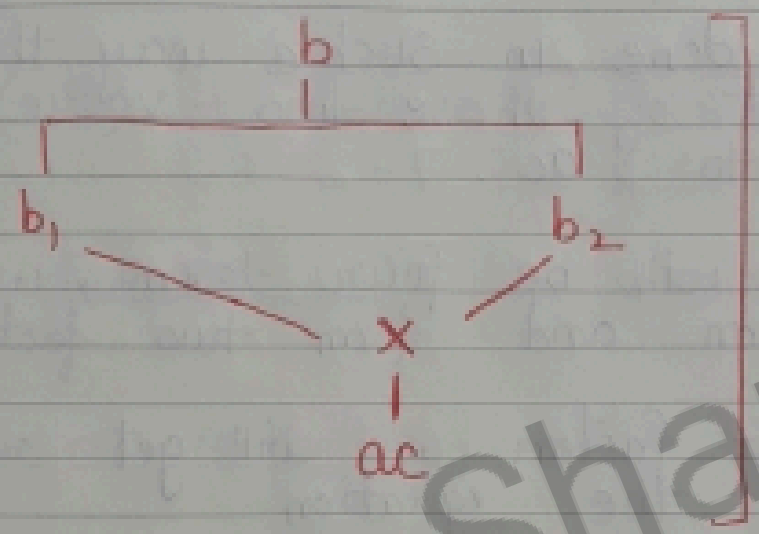
[Middle term split method]

Random working

Shreya Sharma

Eg : $x^2 - 5x + 6$

$a = 1, b = -5, c = 6$



Then it works.

$ac = 1 \times 6 = 6$

Now break -5 to get 6

$= -2 \quad x - 3 = 6$

So here

$x^2 - 5x + 6$

$x^2 - 2x - 3x + 6 = 0$

$x(x-2) - 3(x-2) = 0$

$(x-2)(x-3) = 0$

$x = 3, 2$] Q answer by quadratic eq.

Shreya Sharma

- In this method value of b is split into 2 parts.
- Split is done in such a way that product of those two value is equal to ac.
- There will be four terms, we take common and form two factors
- Solving factors we will get roots of the equation

FORMULA :-

→ $ax^2 + bx + c = 0$

25 SUNDAY

$$d = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

where

a is coeff of x^2
b is coeff of x
c is constant

$a \neq 0$

Shreya Sharma

$x^2 - 5x + 6 = 0$

$= \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$= \frac{-(-5) \pm \sqrt{25-4(1)(6)}}{2(1)}$

$= \frac{5 \pm 1}{2}$] Got 2 answers to solve

So $\alpha = \frac{5+1}{2} = 3$

$\beta = \frac{5-1}{2} = 2$

Now :-

$\alpha + \beta = 3+2 = 5$] $-\frac{b}{a} = \frac{5}{1} = 5$

$\alpha . \beta = 3 \times 2 = 6$] $\frac{c}{a} = \frac{6}{3} = 2$

Product of roots

Shreya Sharma

UNIK PIPE FITTINGS UNIK+ VALVES
Largest Pipe Fittings Group of India

- Construction of quadratic equation

Given $\alpha = 7$
$\beta = -2$

Sum $\alpha + \beta = 7 - 2 = 5$

Product $\alpha\beta = 7(-2) = (-14)$

x^2 - (sum of roots)x + product of roots $= 0$

$\Rightarrow x^2 - 5x + 14 = 0$

[You can reverse too]

$x^2 - (\alpha + \beta)(x) + \alpha\beta = 0$

Shreya Sharma

Now ÷

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- If $d = \sqrt{b^2 - 4ac} = -ve$ → roots imaginary

  No real roots available.

- $b^2 - 4ac > 0$ [+ve] → Perfect square or Not.

  Roots are real $\alpha \neq \beta$

- If $b^2 - 4ac = 0$ → Then roots will be equal

  Real

  bcz $[\sqrt{b^2 - 4ac} = 0]$

Shreya Sharma

Now, concept of $\underbrace{d}_{\text{discriminant}}$] $b^2 - 4ac$

- $b^2 - 4ac = 0$: Real and equal
- $b^2 - 4ac < 0$: Imaginary
- $b^2 - 4ac > 0$: Real and unequal
- $b^2 - 4ac > 0$ & perfect square : Real, unequal & rational
- $b^2 - 4ac > 0$ & not a perfect square : Real, unequal irrational

CONJUGATE PAIRS :-

If 1 root of the equation is

$$\boxed{m + \sqrt{n}}$$

the other one is surely

$$\boxed{m - \sqrt{n}}$$

These are conjugate pairs.

Shreya Sharma

So if one root of eq^n is

$10+\sqrt{3}$

then other root $= 10-\sqrt{3}$

Cubic Equations :-

$$\underbrace{ax^2}_{\text{Coeff of } x^3} + \underbrace{bx^2}_{\text{Coeff of } x^2} + \underbrace{cx}_{\text{Coeff of } x} + \underbrace{d}_{\text{constant}} = 0$$

Method of Solution :

[: Trial and error]

Only with trial and error method] Cubic eq^n's are solved.

Shreya Sharma

PIPE FITTINGS VALVES
Largest Pipe Fittings Group of India
OTES

For eg:

$$x^3 - x^2 - x - 1 = 0$$

$$x^2(x+1) - 1(x+1) = 0$$

$$(x^2 - 1)(x+1) = 0$$

$$(x-1)(x+1)(x+1) = 0$$

$$x = \underbrace{-1, +1, -1}_{\text{Roots}}$$

Shreya Sharma