IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

SHORTCUT TO SOLVING LINEAR EQUATIONS USING VEDIC MATHEMATICS

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Abstract: Vedic mathematics is an ancient method of addressing mathematical problems. Vedic mathematics is widely renowned for the ability to solve mathematical problems more quickly and efficiently. Vedic Mathematics takes a radically different way to solving linear equations. It could be a superior strategy for saving time and reducing the number of algebraic operations required to solve a linear equation.
Index words: 'Sunyam Samyasamuccaye', Zero

Introduction

Vedic Mathematics, also known as Vedic Maths, is a branch of mathematics that has been practised in India for thousands of years [1]. Vedic Mathematics, contrary to popular assumption, is neither a different number system or even a different approach to mathematics. It's an extended set of mathematical principles that was developed to help out with calculations. The calculations that would normally be time-consuming and difficult are made much easier with the help of the Vedic Mathematical Sutras. The premise behind this study is that Vedic Mathematics is not given the esteem it deserves in the field. For the sake of mathematics as a whole, it is important that the concepts of Vedic Mathematics be widely disseminated and practised. Although being called "tricks" or "mental maths" by the West, Vedic Mathematics is the oldest and quickest technique for calculations, and it is a special gift from Ancient India to the rest of the world.

Solving Linear equations using sutras of Vedic Mathematics

Vedic Mathematics is a system of traditional Indian mathematical methods that may be applied to a broad range of mathematical problems, including the solution of linear equations [2,3]. The 'Sunyam Samyasamuccaye' Sutra states, "Samuccaya is the same; it is zero." ‘Samuecaya’ has several meanings depending on the context. It is used to solve equations for six distinct cases.

Case 1- When a term occurs as a common factor in all the terms is equated to zero.

$$\text{i.e.} \quad 4x + 3x = 5x + x$$

$$\text{then} \ , \qquad x = 0 \ \text{(By definition)}$$

But by conventional method, on Simplifying.

$$7x = 6x$$
$$\Rightarrow 7x - 6x = 0$$

Or, $x = 0$

Another illustration is,

$$9(x + 4) = 2(x + 4)$$

According to the definition, $(x + 4)$ is common factor on both sides. Therefore

$$(x + 4) = 0$$

$$\Rightarrow x = -4;$$

By Conventional Method,

$$9x + 36 = 2x + 8$$

$$\Rightarrow 7x + 28 = 0$$

$$\Rightarrow x = -4$$

Case 2 - When the product of the independent terms is the same on both sides, then x is equal to zero.

Example:

$$(x + 3)(x + 8) = (x + 2)(x + 12)$$

As the product of independent terms on both sides is 24, therefore $x = 0$

By Conventional Method,

$$(x + 3)(x + 8) = (x + 2)(x + 12)$$

$$\Rightarrow x^2 + 11x + 24 = x^2 + 14x + 24$$

$$\Rightarrow 14x - 11x = 0$$

$$\Rightarrow 3x = 0$$

$$\Rightarrow x = 0$$

Case 3- If we consider the fractions and the numerators are same, then sum of denominators is zero, which gives value of x.

i.e. if $\frac{m}{f(x)} + \frac{m}{g(x)} = 0.$ Where $f(x)$ *and* $g(x)$ are linear functions

then $f(x) + g(x) = 0$ gives the solutions.

Example:

$$\frac{5}{(x - 8)} + \frac{5}{(x - 9)} = 0.$$

$$\Rightarrow (x - 8) + (x - 9) = 0$$

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

Case 4 - If the sum of numerators and sum of denominators is same, then both the sums are zero; that is if in

$$\frac{N_1}{D_1} = \frac{N_2}{D_2}$$

$$N_1 + N_2 = D_1 + D_2$$

then $N_1 + N_2 = D_1 + D_2 = 0$, gives the solution.

Example:

$$\frac{3x+5}{6x+7} = \frac{x+3}{2x+9}$$

Using above rule-

$$N_1 + N_2 = 4x + 8$$

$$D_1 + D_2 = 8x + 16 = 2(4x + 8)$$

removing the numerical factor

$$4x + 8 = 0$$
$$\Rightarrow x = -2$$

Case 5- If the sum of numerators and sum of denominators is same and the differences of numerators and denominators is same, then both the sums and differences are zero.

This rule is very useful when coefficients of x^2 are not same on the two sides, thus equation becomes quadratic and gives two solutions.

Example:

$$\frac{2x+7}{4x+3} = \frac{3x+5}{x+9}$$

$N_1 + N_2 = 5x + 12;$ $\quad N_1 \sim N_2 = x - 2$

$$D_1 + D_2 = 5x + 12;$$

$$D_1 \sim D_2 = 3x - 6 = 3\,(x - 2)$$

$$\Rightarrow 5x + 12 = 0;$$

$$x - 2 = 0$$

$$\Rightarrow x = -\frac{12}{5}; \quad x = 2$$

By Conventional Method,

$$(2x + 7)(x + 9) = (4x + 3)(3x + 5)$$

$$\Rightarrow 2x^2 + 25x + 63 = 12x^2 + 29\,x + 15$$

$$\Rightarrow 2(5x^2 + 2x - 24) = 0$$

By applying Sridharacharya method, we will get the same solution.

Case 6 - If in sum of fractions, numerators are same on both sides and sum of denominators on L. H.S and R.H.S. be same, then that sum is zero gives, the solution.

$$\frac{m}{p(x)} + \frac{m}{q(x)} = \frac{m}{r(x)} + \frac{m}{s(x)}$$

Where, $p(x), q(x), r(x)$ and $s(x)$ are linear functions.

then according to sutra this sum is zero.

Example:

$$\frac{2}{(2x+5)} + \frac{2}{(2x+7)} = \frac{2}{(x+2)} + \frac{2}{(3x+10)}$$

$$\Rightarrow (2x+5) + (2x+7) = (x+2) + (3x+10)$$

$$4x + 12 = 4x + 12$$

Answer is given by

$$4x + 12 = 0$$

$$\Rightarrow x = -3$$

Conclusions

Vedic Mathematics is based on simple concepts, yet applying those ideas mentally takes training and expertise, much like any other branch of mathematics. As the underlying concepts of Vedic Mathematics are simpler, they may be mentally performed with relative ease. The traditional approach includes isolating the variable on one side of the problem by employing algebraic operations such addition, subtraction, multiplication, and division. This approach is extensively taught and recognised. The Vedic mathematical technique, on the other hand, presents an alternative strategy that, in certain circumstances, may be quicker and more effective. The Vedic mathematics technique has
the benefit of being very quick and capable of solving difficult problems mentally without the aid of a calculator or pencil.

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