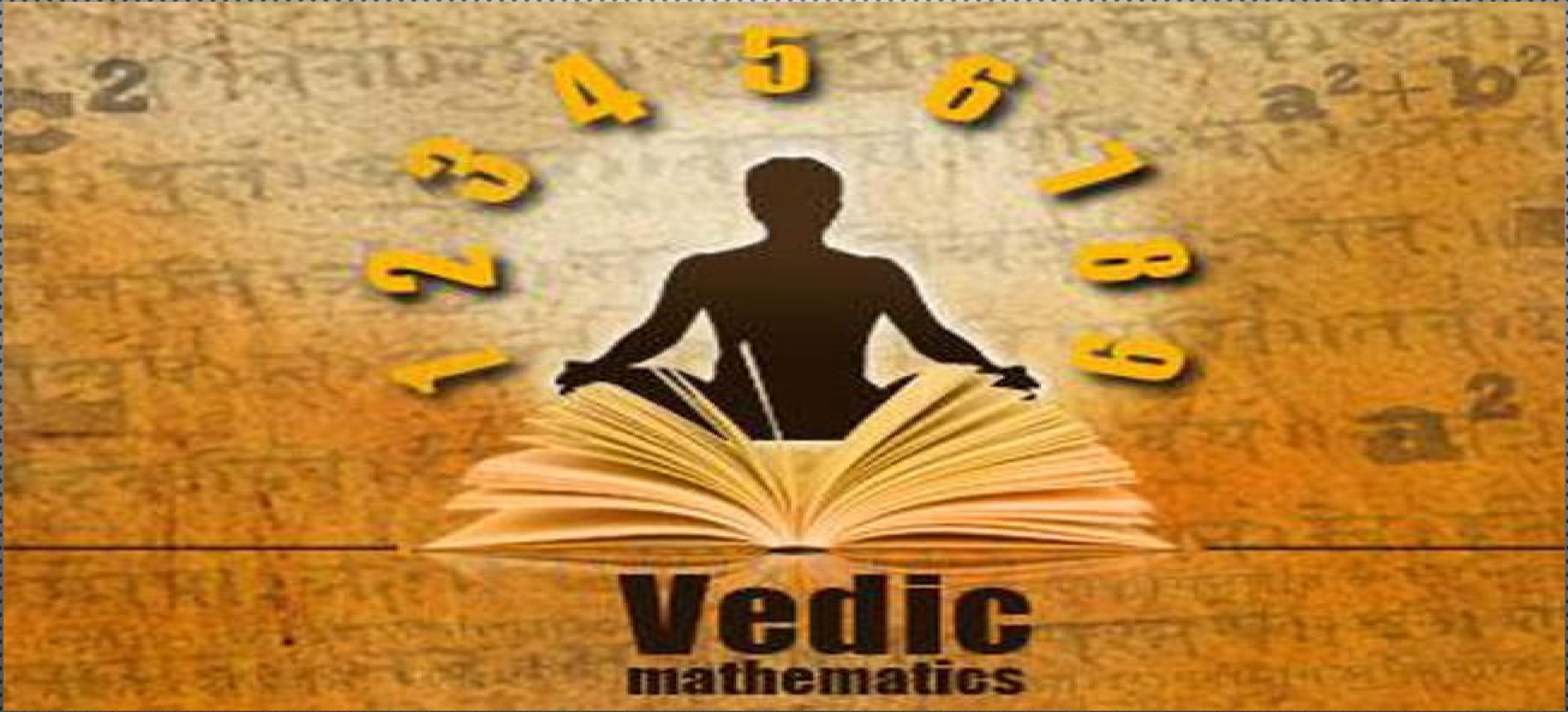


Presented by

SHWETA PATEL

- “A gift given to this world by the ancient sages of India.”
- “A system which is far more simple and enjoyable than modern mathematics.”
- “Research shows that the application of Vedic mathematics makes use of both parts of the brain.”

What is VEDIC MATH ?

- “It is an ancient technique, which simplifies multiplication, divisibility, complex numbers, squaring, cubing, square and cube roots.”
- “Even recurring decimals and auxiliary fractions can be handled by Vedic mathematics.”
- “In the Vedic system difficult problems or huge sums can often be solved immediately by the Vedic method.”

JAGADGURU SHRI BHARATHI KRISHNA TIRTHAJI

- ✓ 1884-1960
- ✓ Govardhan Peeth, Puri Jaganath

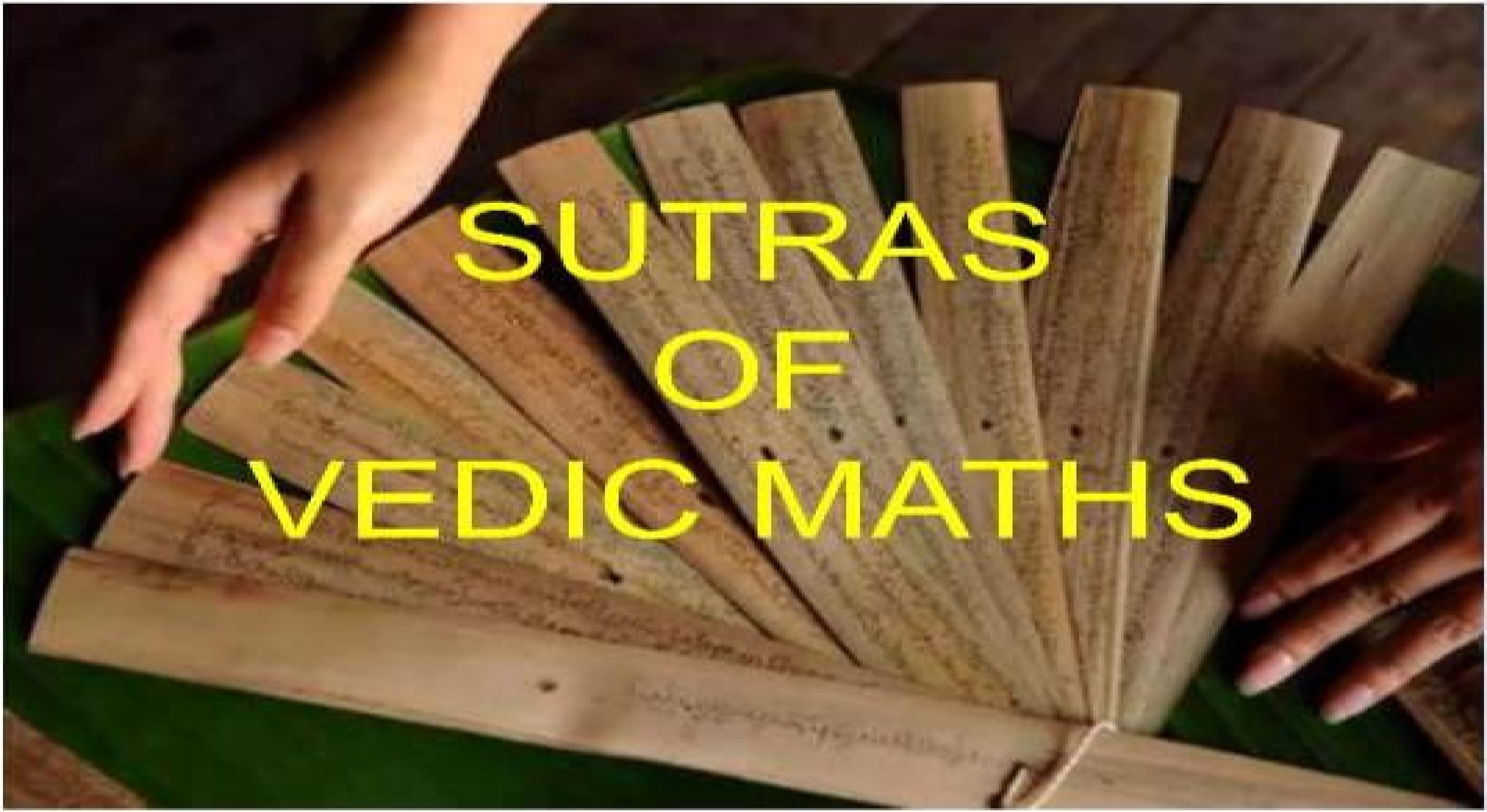
✓ Vedic Mathematics was discovered by this Indian mathematician in the period between A.D. 1911 and 1918

✓ Vedic Mathematics was revived largely due to his efforts of which he claimed that it based on a lost appendix of Atharvaveda, an ancient text of the Indian teachings called Veda.

✓ Having researched the subject for years, even his efforts would have gone in vain but for the enterprise of some disciples who took down notes during his last days.

Sixteen Sutras and their corollaries

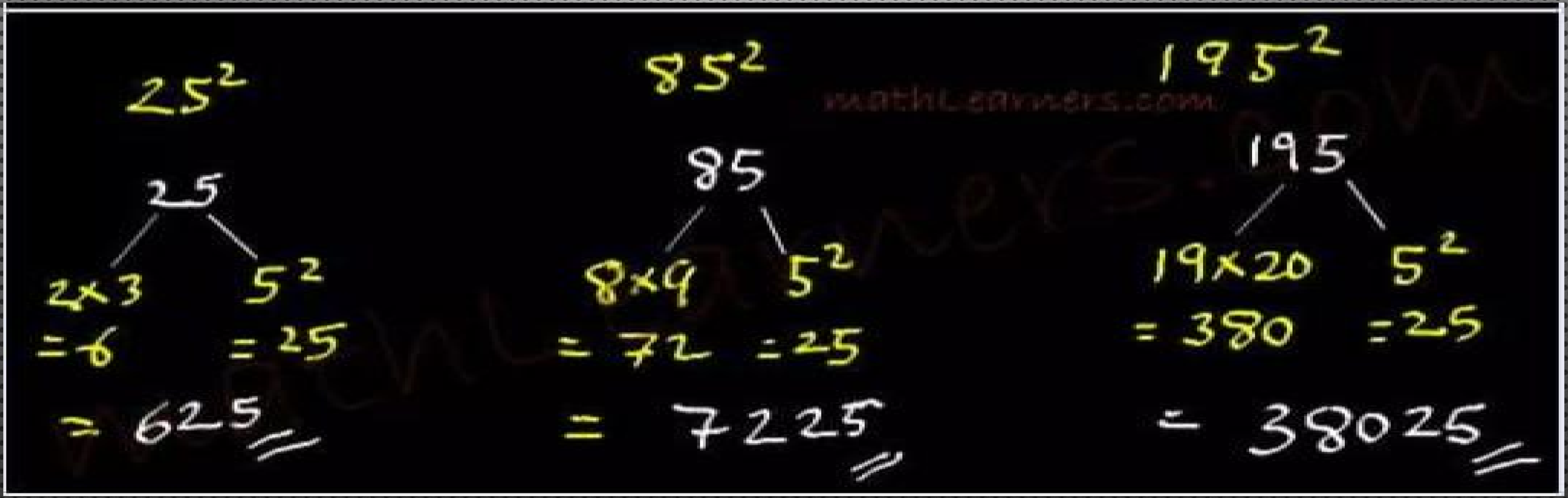
Sl. No	Sutras	Sub sutras or Corollaries
1.	Ekādhikena Pūrvena (also a corollary)	Ānurūpyena
2.	Nikhilam Navataścaramam Daśatah	Śisyate Śesamjnah
3.	Ūrdhva - tiryagbhyām	Ādyamādyenantyamantyena
4.	Parāvartya Yojayet	Kevalaih Saptakam Gunỹat
5.	Sūnyam Samyasamuccaye	Vestanam
6.	(Ānurūpye) Śūnyamanyat	Yāvadūnam Tāvadūnam
7.	Sankalana - vyavakalanābhyām	Yāvadūnam Tāvadūnīkrtya Vargañca Yojayet
8.	Puranāpuranābhyām	Antyayordasake' pi
9.	Calanā kalanābhyām	Antyayoreva
10.	Yāvadūnam	Samuccayagunitah
11.	Vyastisamastih	Lopanasthāpanabhyām
12.	Śesānyankena Caramena	Vilokanam
13.	Sopantyadvayamantyam	Gunitasamuccayah Samuccayagunitah
14.	Ekanyūnena Pūrvena	
15.	Gunitasamuccayah	
16.	Gunakasamuccayah	


SUTRAS
OF
VEDIC MATHS

1. EKADHIKENA PURVENA

. MEANING: "BY ONE MORE THAN THE PREVIOUS ONE".

APPLICATION: USEFUL FOR SQUARING NUMBERS THAT END IN 5.



2. NIKHILAM NAVATASHCARAMAM DASHATAH

MEANING: "ALL FROM 9 AND THE LAST FROM 10".

APPLICATION: MULTIPLYING NUMBERS CLOSE TO BASE POWERS OF 10 (E.G., 100, 1000).

EXAMPLE – 98×97(BASE IS 100).

98 IS 2 LESS THAN 100 . 97 IS 3 LESS THAN 100
THE LEFT PART OF ANSWER IS 98 -3 (OR 97-2) = 95
THE RIGHT PART IS THE PRODUCT OF DIFFERENCES
(-2) ×(-3)=06

. THE ANSWER IS 9506

3.URDHVA-TIRYAGBHYAM

MEANINIG - VERTICALLY AND CROSS WISE

APPLICATION - GENERAL MULTIPLICATION METHOD FOR ANY SET OF NUMBERS.

EXAMPLE - 21×23

VERTICAL - 1×3 =3(LAST DIGIT).
CROSS WISE - (2×3)+(1×2) = 6+2= 8(MIDDLE DIGIT)
VERTICAL - 2×2=4(FIRST DIGIT)
ANSWER - 483

PARAAVARTYA YOJAYET

MEANING: "TRANSPOSE AND ADJUST".

APPLICATION: A METHOD FOR DIVISION, ESPECIALLY FOR DIVISORS SLIGHTLY LARGER THAN A POWER OF 10.

EXAMPLE -

2587 ÷ 112

112 | 2 5 8 7
-1-2 | -2-4
-3 -6
2 3 4 1

Quotent and Remainder -23 and 41

No.of digits in quotient = (diff .b/t no.of digits in dividend and divisor) + 1

289487 ÷ 13103

13103 | 2 8 9 4 8 7
-3-10-3 | -6-2 0-6
-6-2 0-6
2 2 1 2 2 1

Quotent and Remainder - 22 and 1221

5. ŚŪNYAṀ SĀMYASAMUCCAYE

MEANING: “IF THE SUM IS THE SAME, THAT SUM IS ZERO”.

APPLICATION: USED FOR SOLVING CERTAIN TYPES OF LINEAR AND QUADRATIC EQUATIONS BY OBSERVATION.

Example: Solve $9(x-3)=5(x-3)$

1. By observation, the term $(x-3)$ is common on both sides of the equation.
2. According to the sutra, if a common term exists, that term can be equated to zero.
3. $x-3=0 \implies x=3.$

6. ANURUPYENA SHUNYAMANYAT

MEANING: IF ONE TERM IS IN RATIO, THE OTHER TERM IS ZERO.

APPLICATION: SOLVING RATIO AND PROPORTION PROBLEMS.

Eg: 46 X 44 =
Working base: 40
Multiplication base = 10 x 4 = 40
Division = 100 / 2 = 50

46 +6
44 +4
cross add | Product
50 | 24 (keep 4 and carry 2)
x4 (mul.base)
200 +carry 2= 2024

7. SANKALANA-VYAVAKALANABHYAM

MEANING: USING ADDITION AND SUBTRACTION TO SIMPLIFY CALCULATIONS.

APPLICATION: SQUARING NUMBERS AND OTHER CALCULATIONS.

Eg1: Single digit add 43+ 8

43+10-2 = 53-2=51

Eg2: Double digit add 33+19

33+20-1 = 53-1= 52

Eg3: Subtract 55-9 = 55-10 +1 = 45 +1= 46

Eg4: 3 digit add 105+129

100+129+5= 229+5 = 234

8. PURANAPURANABHYAM

MEANING: COMPLETING OR NOT COMPLETING THE CALCULATION.

APPLICATION: SQUARING NUMBERS CLOSE TO A BASE.

1. Solve quadratic, biquadratic

Eg1: Qudratic equation: $x^2 + 2x - 8 = 0$

$$x^2 + 2x.1 + 1^2 - 1 - 8 = 0$$

$$(x+1)^2 - 9 = 0$$

$$(x+1)^2 = 9$$

$$(x+1)^2 = 3^2$$

$$x+1 = -3 \Rightarrow x = -4$$

x $\quad x + 1 = 3 \Rightarrow x = 2$

9. CHALANA-KALANABHYAM

MEANING: USING DIFFERENCES AND DIFFERENCES OF DIFFERENCES.

APPLICATION: CALCULATING SQUARES AND CUBES EFFICIENTLY.

Differences and Similarities.

Solve $x^2 - 2x - 4 = 0$

$D = b^2 - 4ac$

$= (-2)^2 - 4.1.(-4) = 20$

Differentiate => $2x-2 = \pm\sqrt{20}$

$2x-2 = +\sqrt{20}$, $2x-2 = -\sqrt{20}$

$2(x-1) = +2\sqrt{5}$, $2(x-1) = -2\sqrt{5}$

$(x-1) = +\sqrt{5}$, $(x-1) = -\sqrt{5}$

$\mathbf{x = 1 + \sqrt{5}}$, $\mathbf{x = 1 - \sqrt{5}}$

10. YAVADUNAM TAVADUNAM

MEANING: REDUCE THE NUMBER BY ITS DEFICIENCY AND SET UP THE SQUARE OF THE DEFICIENCY.

APPLICATION: SQUARING NUMBERS NEAR A BASE.

Eg: $94^2 = (94-6)^2$

$= 88 \mid 6^2$

$= 8836$

Find the squares more than 100

$102^2 = (102+2)^2$ 102-100= 02

$= 102 \mid 02^2$

$= 102\ 04$

Squaring from 969 to 999

$969^2 = (969-31) \mid 31^2$ 1000-969= 31

$= 938\quad 961$

11. VYAVAKALANAM

MEANING: SUBTRACTING NUMBERS .

APPLICATION: QUICK SUBTRACTION

EXAMPLE: 1000 – 357 = 643.

12. SOPAANTYADVAYAMANTYAM

MEANING: THE ULTIMATE AND TWICE THE PENULTIMATE

EXAMPLE:

Ultimate + Twice the penultimate (U+2P)

624 X 12 = -----

Step1: make a sanwitch number with zero

0 6 2 4 0

P U

U+2P => (6+(2X0)) (2+(2X6)) (4+(2X2)) (0+(2X4))

=> 6 14 8 8 => 7 4 8 8

13. EKANYUNENA PURVENA

MEANING: BY ONE LESS THAN THE PREVIOUS ONE .

EXAMPLE :

9999 x 2378 = 23777622

2377 / 7622

Part I- One less than 2378 is 2377

Part II – (9-2)(9-3)(9-7)(9-7) = 7622

14. GUNITASAMUCCAYAH

MEANING : THE PRODUCT OF THE SUM OF THE COEFFICIENT IS EQUAL THE SUM OF COEFFICIENT IN THE PRODUCT

EXAMPLE :

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

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

coefficient of x^2 is 1

coefficient of x is 5

const.coefficient is 6

sum of the coefficient is 1+5+6= 12 --(I)

Higher degree coefficent is 1, substitute 1 in factors (1+3)(1+2) = 4x3=12 ---(II)

15. GUNAKASAMUCCAYAH

MEANING: WHEN THE REMAINDERS ARE THE SAME.

EXAMPLE:

$x^2+5x+4= (x+4)(x+1)$

$2x+5 = (x+4)+(x+1)$

The factors of the sum are the same as the sum of the factors.

16. DHVAJANKA

MEANING: FLAG

EXAMPLE

Division 74862 ÷ 73

$$
\begin{array}{l|l}
7^3 & 74_1 8_4 6\ _5 2 \\
 & \ \ 3\ 0\ 6\ 15 \\
\hline
 & 1\ 18\ 40\ 37 \\
\hline
\end{array}
$$

quotient **1025**

QUOTIENT = 1025
Remainder =37

Step1: 7/7= quotient 1
Step2: 3x1 =3
Step3: 4-3=1
Step4: 1 / 7= quotient 0, remainder 1
Step5: 3 x 0 =0
Step6: 18-0 =18
Step 7: 18/7= quotient 2, remainder 4
Step 8: 3 x 2 =6
Step 9: 46-6 =40
Step10: 40/7= quotient 5, remainder 5
Step11: 3x5=15

SUB SUTRAS OF VEDIC MATHS

1. ANURUPYENA

MEANING - PROPORTIONATELY

CONCEPT : THIS SAB SUTRA IS USED FOR MULTIPLICATION WHEN NUMBER ARE NEAR COMMON BASE [EXAMPLE 40 50 ETC] IT ADJUST THE BASE PROPORTIONALLY .

EXAMPLE 48 × 47

BASE – 50 (WHICH IS 100/2)

DIFFERENCES- 48-50= -2 ,47-50= -3

CROSS SUBTRACT- 48-3=45

ADJUST – SINCE BASE IS 100/2, DIVIDE 45 BY 2 : 45/2=22.5

RIGHT SIDE – MULTIPLY DIFFERENCE – (-2)×(-3)=6

COMBINE- 225 (FROM 22.5×10) AND 6, GIVING 2256

2. SISYATE SESASAMJNAH

MEANING – THE REMINDER REMAIN CONSTANT

CONCEPT – USED FOR ADDING NUMBER BY MAKING ONE NUMBER CONVENIENT MULTIPLE OF 10 AND ADJUSTING THE OTHER NUMBER ACCORDINGLY .

EXAMPLE – 35+58

CONVERT 58 TO 60 BY ADDING

SUBTRACT 2 FROM 35: 35-2= 33

ADD – 33+60=93

3. ADYAMADYENANTYAMATYENA

MEANING - FIRST BY THE FIRST AND LAST BY THE LAST

CONCEPT - A COROLLARY TO URDHAVA TIRYAGBHYAM (VERTICALLY AND CROSS WISE)SUTRA USED FOR MULTIPLYING NUMBER WHERE THE INITIAL DIGIT ARE SAME .

EXAMPLE – 42×48
FIRST PART MULTIPLY THE FIRST DIGIT BY ONE MORE THAN ITSELF :
4×[4+2]=4×5=20
SECOND PART MULTIPLY THE LAST DIGITS
2×8=16
COMBINE - 2016

4. KEVALAIH SAPTAKAM GUNYAT

MEANING FOR 7 THE MULTIPLICANT IS 143.

CONCEPT - A SPECIALISED METHOD FOR DIVISION BY 7,USING THE RECIPROCAL OF 7. (2/7= 0.142857 ....) TO QUICKLY FIND RECURRING DECIMAL PATTERN.

EXAMPLE CONVERT 3 / 7 TO DECIMAL
MULTIPLY – 3×142857=428571
RESULT – THE DECIMAL IS 0.428571....

5. VESTANAM

MEANING – BY OSCULATION

CONCEPT – THIS ADVANCED TECHNIQUE IS USED FOR TESTING THE DIVISIBILITY OF A NUMBER . IT USES A POSITIVE OR NEGATIVE OSCULATOR TO CHECK FOR DISABILITY BY CERTAIN NUMBERS

EXAMPLE - CHECKING IF 345 IS DIVISIBLE BY 7
OSCULATOR- THE OSCULATOR FOR 7 IS 5
TEST – 34+(5×5)=35+25=59
SINCE 59 IS NOT DIVISIBLE BY 7,345IS NOT DIVISIBLE BY 7

6. YAVADUNAM TAVADUNAM

MEANING - LESSEN BY THE DEFICIENCY

CONCEPT - A METHOD FOR SQUAREING NUMBERS NEAR A BASE (POWER OF 10)BY FINDING (THE DEFICIENCY THE DIFFERENCE FROM THE BASE)

EXAMPLE CALCULATE 96 SQUARE
BASE -100
DEFICIENCY – 100-96=4
LEFT PART – SUBTRACT THE DEFICIENCY FROM THE NUMBER : 96-4 = 92
RIGHT PART – SQUARE THE DEFICIENCY: 4 SQUARE=16
COMBINE : 9216

7. YAVADUNAM TAVADUNIKRTYA VARGANCA YOJAYET

MEANING - WHATEVER THE DEFICIENCY, LESSEN BY THAT AMOUNT AND SET UP THE SQUARE OF THE DEFICIENCY .
CONCEPT - THIS IS MORE FORMAL VERSION OF THE PREVIOUS SUB SUTRA SPECIFICALLY FOR SQUARING NUMBER NEAR A BASE .

EXAMPLE - CALCULATE 104 SQUARE
BASE – 100
SURPLUS – 104-100=4
LEFT PART – ADD THE SURPLUS TO THE NUMBER:104+5=108
RIGHT PART- SQUARE THE SURPLUS:4 SQUARE=16
COMBINE : 10816

8. ANTYAYORDASAKE'PI

MEANING- LAST TOTALLING10[AND THE PREVIOUS DIGIT ARE THE SAME].

CONCEPT - USED FOR MULTIPLICATION WHEN THE LAST DIGIT OF TWO NUMBER ADD UP TO 10 AND PRECEDING DIGIT ARE THE IDENTICAL.

EXAMPLE – 32×38
LAST DIGIT – 2+8=10
FRIST PART – MULTIPLY THE COMMON DIGIT 3 BY ITS SUCCESSOR 4 : 3×4=12
SECOND PART – MULTIPLY THE LAST DIGIT – 2×8=16
COMBINE- 1216

9. ANTYAYOREVA

MEANING - ONLY THE LAST TERM

CONCEPT - SPECIALISED RULE RELATED TO THE MAIN SUTRA EKANYUNENA PURVENA [BY ONE LESS THAN THE PREVIOUS ONE]USED FOR MULTIPLICATION BY A SERIES OF NINES.

EXAMPLE – 45×99

LEFT PART – SUBTRACT 1 FROM 45 :45-1=44
RIGHT PART – SUBTRACT 45 FROM 100: 100-45=55
COMBINE - 4455

10. SAMUCCAYAGUNITAH

MEANING - THE PRODUCT OF THE SUM IS THE SUM OF PRODUCT

CONCEPT - A VALUABLE METHOD FOR VERIFYING THE ACCURACY OF MULTIPLICATION DIVISION AND FACTORIZATION

EXAMPLE VERIFY 12 ×13 = 156

SUM OF DIGIT (FACTOR):

(1+2)+(1+3)=3×4=12

SUM OF DIGIT (PRODUCT):

1+5+6=12

SINCE 12=12,THE ANS IS CORRECT

11. LOPANASTHAPANABHYAM

MEANING - BY ALTERNATE ELIMINATION AND RETENTION

CONCEPT - AN ALGEBRAIC TECHNIQUE FOR SOLVING SIMULTANEOUSLY LINEAR EQUATION SPECIALLY WHEN THE COEFFICIENT ARE INTERCHANGED

EXAMPLE SOLVE 45X + 55 Y = 100 AND
55 X + 45 Y = 100
ADD EQUATION : 100X + 100Y=200
X+Y=2
SUBTRACT EQUATION : -10X+10Y=0
-X+Y=0
SOLVE : SUBSTITUTE X=Y INTO X+Y=2
TO GET X=2,Y=1

12. VILOKANAM

MEANING – BY OBSERVATION

CONCEPT - SOLVING PROBLEM INSTANTLY BY LOOKING FOR PATTERNS AND APPLYING A SPECIFIC RULE

EXAMPLE -SUM 7+6+3+4
OBSERVATION – NOTICE THAT 7+3=10 AND 6+4=10
SOLVE – 10+10=20

13. GUNITASAMUCCAYAH SAMUCCAYAGUNITAH

MEANING -THE PRODUCT OF THE SUM IS THE SUM OF PRODUCT

CONCEPT -A VERIFICATION TECHNIQUE USED TO CHECK THE CORRECTNESS OF ALGEBRAIC EXPRESSION AND FACTORIZATIONS RELATING THE SUM OF COEFFICIENT IN THE FACTORS AND THE PRODUCT

EXAMPLE – VERIFY

(X+1)(X+2)(X+3)=X*3+6X*2+11X+6

SUM OF COEFFICIENT (FACTOR):

(1+1)(1+2)(1+3)=2×3×4=24

SUM OF COEFFICIENT (PRODUCT):

1+6+11+6=24

SINCE 24=24,THE EXPANSION IS CORRECT


THANK
YOU

INTRODUCTION TO VEDIC MATHS

BY- ANIL PATEL

VEDIC MATHS

"Vedic" means "from the Vedas," the ancient Indian scriptures.

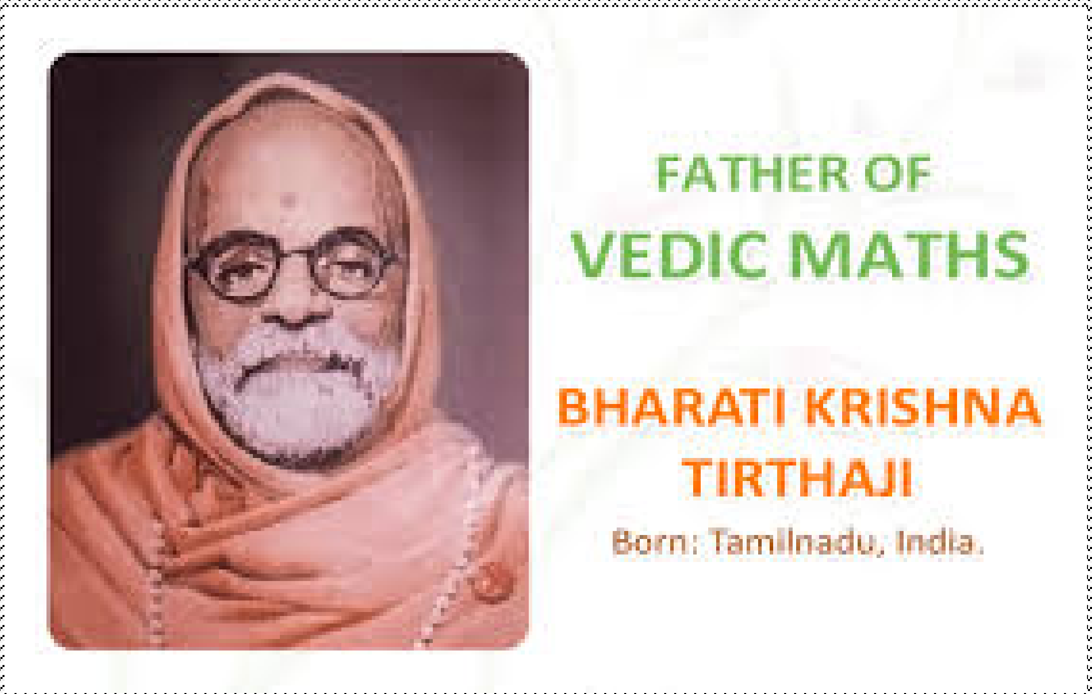
Vedic Maths was rediscovered by Swami Bharati Krishna Tirthaji in the early 20^{th} century.

It uses simple rules and patterns to solve difficult problems easily.

It helps in doing mental maths quickly.

Importance of Vedic Maths

1. Makes calculations fast and accurate.
2. Builds concentration and memory.
3. Reduces dependence on calculators.
4. Helpful for competitive exams.
5. Makes learning maths fun and interesting.



Vedic Maths Sutras

Sutras

1. Ekadhiken Purvena
2. Nikhilam Navatacharamam Dasatah
3. Urdhva-tiryagbhyam
4. Paravartya Yojayet
5. Sunyma Samyasamuchaye
6. Sunyamanyat
7. Sankalana-vyavakalamnabyam
8. Puranapuranabhyam
9. Chalana-Kalanabhyam
10. Yavadunam
11. Vyastisamastih
12. Sesanyankena Caramena
13. Sopantyadvayamantyam
14. Ekanyunena Purvena
15. Gunitasamuccayah
16. Gunakasamuccayah

Sub-sutras

1. Anurupyena
2. Sisyate Sesajnah
3. Adyamadyenantya-mantyena
4. Kevalaih Saptakam Gunyat
5. Vestanam
6. Yavadunam Tavadunam
7. Yavadunam Tavadunikrtya Varganca Yojayet
8. Antyayoradaskaepi
9. Antyayoreva
10. Samuccayagunitha
11. Lopanasthapanabhyam
12. Vilokanam
13. Gunitasamuccayah Samuccayagunitah

THE SUTRAS-

1. **Ekadhikena Purvena:** By one more than the previous one.

$35^2 = 1225$

12 / 25

Part I- one more than the previous one

$3+1=4$ $\quad$ $3 \times 4 = 12$

Part II – (SECOND Number)^2

$5^2 = 25$

Nikhilam Navatashcaramam

Dashatah: All from 9 and the last from 10.

100000 - 43658 = 056342

Step1: Need to subtract 5 digits, so separate 5 digits as one part, remaining is part two

1 / 00000

Step 2: Subtract 1 from first part,

Step3: Sub first four digits from 9, last digit from 10.

3. Urdhva-Tiryagbhyam:

Vertically and crosswise.

24 x 36 = 864

Step1: Last digits : (right) multiply vertically

4 x 6 = 24 . keep 4 carry over 2

Step2: Cross product (2x6)+(3x4) = 24.

keep 4 & add the last carry over

Step3: First digits: (left) multiply vertically and add the last carry over (2x3)+2 =8

4. Paraavartya Yojayet:

Transpose and apply.

2587 ÷ 112

112 | 2 5 8 7

-1-2 | -2-4

-3 -6

2 3 4 1

Quotent and Remainder -23 and 41

No.of digits in quotient = (diff .b/t no.of digits in dividend and divisor) + 1

289487 ÷ 13103

13103 | 2 8 9 4 8 7

-3-10-3 | -6-2 0-6

-6-2 0-6

2 2 1 2 21

Quotent and Remainder - 22 and 1221

5. Shunyam Saamyasamuccaye:

Meaning3: Samuccaye means sum of the denomenators, when the numerators are same.

Eg: $\frac{1}{3x-1}+\frac{1}{4x-1} = 0$

The numerators are same, Add the denominators and put =0

$$(3x-1)+(4x-1) = 0$$

$$7x - 2 = 0$$

$$x = 2/7$$

5. Shunyam Saamyasamuccaye:

Meaning4: Samuccaye means combination -> if the sum of the denomenators is equal to the numerators then equate that sum to zero

.Eg: $\frac{2x+5}{2x+11} = \frac{2x+11}{2x+5}$

Sum of numerators = 2x+5+2x+11 = 4x+16

Sum of denomenators = 2x+11+2x+5 = 4x+16

Equate that sum to zero 4x+16=0 => x = - 4

6. VYASTI SAMASTIH-individuality or the part, while Samashti means collectivity or the whole.

Example 1
58 x 62 = 3,596

From the above question, we find that 60 can be chosen as an average value for 62 and 58. And 62 is 4 numbers higher than 58, and for 62, it is 4 less than the number 58. Halving the difference, it is 4/2 = 2

So,

Step 1: Square the average value (here it is 60): 60 x 60 = 3600
Step 2: Square the halved difference (here it is 2): 2 x 2 = 4 (i.e., 62 – 58 = 4)
Step 3: Subtracting the above results got from Step 1 and Step 2, we get 3600 – 4 = 3,596
Therefore , 58 x 62 = 3,596

7.Sankalana-Vyavakalanabhyam:

By addition and by subtraction.

Eg1: Single digit add 43+ 8

43+10-2 = 53-2=51

Eg2: Double digit add 33+19

33+20-1 = 53-1= 52

Eg3: Subtract 55-9 = 55-10 +1 = 45 +1= 46

Eg4: 3 digit add 105+129

100+129+5= 229+5 = 234

8. **Puranapuranabhyam:** By the completion or non-completion.

1. Solve quadratic, biquadratic

Eg1: Qudratic equation: $x^2 + 2x - 8 = 0$

$$x^2 + 2x.1 + 1^2 - 1 - 8 = 0$$

$$(x+1)^2 - 9 = 0$$

$$(x+1)^2 = 9$$

$$(x+1)^2 = 3^2$$

$$x+1 = -3 \Rightarrow x = -4$$

x

$$x + 1 = 3 \Rightarrow x = 2$$

Eg2: CUBIC EQUATION $x^3 + 6x^2 + 11x + 6 = 0$

compare $x^3 + 3.x^2.2 + 11x + 6 = 0$ & $a^3 + 3.a.b.(a+b) + b^3 = 0$

$x^3 + 3.x.2.(x+2) + 2^3 - 8 - 3.x.4 + 11x + 6 = 0$

$(x+2)^3 - 2 - 12x + 11x = 0$

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

$(x+2)^3 = (x+2) \Rightarrow a^3 = a \Rightarrow a(a^2-1) = 0$

$\Rightarrow a = 0,\ a = 1,\ a = -1$

$a = 0 \Rightarrow x + 2 = 0 \Rightarrow x = -2$

$a = 1 \Rightarrow x + 2 = 1 \Rightarrow x = -1$

$a = -1 \Rightarrow x + 2 = -1 \Rightarrow x = -3$ Solutions $x = -2, -1, -3$

9. Chalana-Kalanabyham:

Differences and Similarities.

Solve $x^2 - 2x - 4 = 0$

$D = b^2 - 4ac$

$= (-2)^2 - 4.1.(-4) = 20$

Differentiate => $2x-2 = \pm\sqrt{20}$

$2x-2 = +\sqrt{20}$, $2x-2 = -\sqrt{20}$

$2(x-1) = +2\sqrt{5}$, $2(x-1) = -2\sqrt{5}$

$(x-1) = +\sqrt{5}$, $(x-1) = -\sqrt{5}$

$\mathbf{x = 1 + \sqrt{5}}$, $\mathbf{x = 1 - \sqrt{5}}$

10. Yaavadunam: Square its deficiency, Whatever the extent of its deficiency.

Find the squares between 1 to 100

Eg: $94^2 = (94-6)^2$

$= 88 \mid 6^2$

$= 8836$

Find the squares more than 100

$102^2 = (102+2)^2$ $\quad$ 102-100= 02

$= 102 \mid 02^2$

$= 102\ 04$

Squaring from 969 to 999

$969^2 = (969-31) \mid 31^2$

1000-969= 31

$= 938 \quad 961$

11. Shesanyankena Charamena: The remainders by the last digit.

Converting recurring decimal to fractions

	Quotient	remainde r	x7	last digit
1/7				
10/7	1	3	21	1
30/7	4	2	14	4
20/7	2	6	42	2
60/7	8	4	28	8
40/7	5	5	35	5
50/7	7	1	07	

1/7= 0.142857

12. Sopaantyadvayamantyam:

The ultimate and twice the penultimate.

Ultimate + Twice the penultimate (U+2P)

624 X 12 = -----

Step1: make a sanwitch number with zero

0 6 2 4 0

P U

U+2P => (6+(2X0)) (2+(2X6)) (4+(2X2)) (0+(2X4))

=> 6 14 8 8 => 7 4 8 8

13.Ekanyunena Purvena: By one less than the previous one.

9999 x 2378 = 23777622

2377 / 7622

Part I- One less than 2378 is 2377

Part II = (9-2)(9-3)(9-7)(9-7) = 7622

14. Gunitasamuccayah:

The Product of the sum of the coefficient is equal the sum of the coefficient in the product.

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

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

coefficient of x^2 is 1

coefficient of x is 5

const.coefficient is 6

sum of the coefficient is 1+5+6= 12 --(I)

Higher degree coefficent is 1, substitute 1 in factors (1+3)(1+2) = 4x3=12 ---(II)

15. **Gunakasamuccayah:**

The factors of the sum are the same as the sum of the factors.

$x^2+5x+4= (x+4)(x+1)$

$2x+5 = (x+4)+(x+1)$

The factors of the sum are the same as the sum of the factors.

16. Dhvajanka: Flag.

Division 74862 ÷ 73

7^3	$7 4_1 8_4 6\ _5 2$
	3 0 6 15
	1 18 40 **37**

quotient **1025**

QUOTIENT = 1025
Remainder =37

Step1: 7/7= quotient 1
Step2: 3x1 =3
Step3: 4-3=1
Step4: 1 / 7= quotient 0, remainder 1
Step5: 3 x 0 =0
Step6: 18-0 =18
Step 7: 18/7= quotient 2, remainder 4
Step 8: 3 x 2 =6
Step 9: 46-6 =40
Step10: 40/7= quotient 5, remainder 5
Step11: 3x5=15

THE SUBSUTRAS-

ANURUPYENA – WHICH MEANS PROPORTIONATELY

Suppose we have to multiply 468 by 480:

Since both these numbers are far away from 1000, we take 1000 as our theoretical base and 1000/2 = 500 as our working base

We then work-out the multiplication as before and to the answer obtained, we divide the left-hand portion of the result in the same proportion as our theoretical base is to the working base (in this example divide by 2)

```
(468 * 480)

        (1000/2 = 500)
468     -32
480     -20
-----------------
448     640
/2
-----------------
224     640     = 224640
```

”SISYATE SESAJNAH”- WHAT REMAINS IS CALLED THE REMAINDER.

Problem: Factor x ^ 2 + 5x + 6

Application: The sutra Adyamadyenantya-mantyena is used to find the first and last terms of the factors.

The first term of the factors is the square root of the first term of the expression, which is x(x.x = x ^ 2)

The last term of the factors is found by looking for two numbers that multiply to 6 and add up to 5 (the middle term).

Solution: The two numbers are 2 and 3 because 2 * 3 = 6 and 2 + 3 = 5. Therefore, the factors are (x + 2) and(x + 3)

"Adyamadyenantya-mantyena"- The first by the first and the last by the last

- **Example: To find the area of a rectangle with a length of 6'4" and a width of 5'8", you would apply the sutra. Multiply the first parts: 6 x 5 = 30 (representing 30 square feet). Multiply the last parts: 4 × 8 = 32 (representing 32 square inches). Combine the results: The area is 30 square feet and 32 square inches. This method is a shortcut to avoid more complex conversion and multiplication, but further steps may be needed if the inches exceed 12 (as explained in the source)**

multiplicand is 143

Application to fractions:

1/7=0.142857….

While 143 is used, the actual number to remember is 142857

This number is cyclic, meaning the decimal expansions of 2/7, 3/7, 4/7, 5/7, and 6/7 are just permutations of these digits.

How it works: The number 143 acts as a memorable anchor for the repeating pattern 142857. By remembering this sequence, one can quickly calculate the decimal value for any fraction with a denominator of 7.

Vestanam Sutra-by OscUlation

Osculators: There are two types:
Positive Osculator: Used with a divisor ending in 9 (e.g., the osculator for 19 is 1).
Negative Osculator: Used with a divisor ending in 1 (e.g., the osculator for 11 is -1).

<u>Examples of using Vestanam-</u>

Finding the positive osculator for 13:

The positive osculator for 13 is 4.
This is calculated by taking the last digit (3), multiplying it by 4 to get 12, and then adding 1 to the first digit (1) to get 2. 1 becomes 2, 3 becomes 2, resulting in 22. This process is repeated until the remainder is 1.

Finding the negative osculator for 19:

The negative osculator for 19 is 2.

This is calculated by taking the last digit (9), multiplying it by 2 to get 18, and then subtracting 1 from the first digit (1) to get 0. 1 becomes 0, 9 becomes 8, resulting in 08, or 8. This process is repeated until the remainder is 1.

“Yavadhunam Tavadhunam”-As much as is subtracted, so much is given.

For example, the square of 99 is 1 less than 100.
If you subtract 1 from 99, you get 98.
Multiplying 1 by 1 gives 1.
Therefore, the square of 99 is 9801.

Yavatinam tavathunikritya varganja yojayet”

Example: square of 98

1. Find the defect: 100-98 = 2.

2. Subtract the minus from the number: 98-2 = 96. This is the first part of the square.

3. Find the square of the defect: 22 = 4. This is the last part of the square.

4. Conclusion: 964. Therefore, 982 = 9604 (i.e., 96 and 04 should be written together).

Antyardeshkepi-used for multiplying numbers where the sum of the unit digits is 10 and the other digits are the same.

Example: 32 x 38

1. Check the conditions: The last digits, 2 and 8, sum to 10. The preceding digits, 3 and 3, are the same.

2. Calculate the right part: Multiply the last digits: 2 x 8 = 16. This is the right part of your answer.

3. Calculate the left part: Take the preceding digits, 3. Add 1 to it to get 4. Multiply these two numbers: 3 x 4 = 12. This is the left part of your answer.

4. Combine the parts: Place the left part before the right part to get the final answer: 1216.

Antyayoreva - “only the last terms” or “only the last digits”.

Example: To multiply 35 by 11:

1. Write the last digit, 5.

2. Add 3 + 5 = 8, and place it before the 5.

3. Write the first digit, 3, before the 8.

4. The result is 385.

Samuccayagunitah-"The sum of the coefficients in the product".

Example:

Factors: (x + 3)(x + 2)

Sum of coefficients in factors: (1+3) and (1+2)

Product of the sums of coefficients: (4)(3) = 12
Product of factors: $x^2 + 5x + 6$
Sum of coefficients in product: 1+5+6=12

Application: This sub-sutra is also known as "Gunitasamuccayah Samuccayagunitah" and can be used for biquadratic and cubic equations as well.

Lopanasthapanabhyam

This method is used in Vedic mathematics to find the highest common factor (HCF) of polynomials.

Steps for finding the HCF of $x^2 + 7x + 6$ and $x^2 + 5x + 4$

1. Subtract the polynomials: Subtract the second polynomial from the first to eliminate the highest power term (x^2).

$(x^2 + 7x + 6) - (x^2 + 5x + 4)$

2. Simplify the expression: This results in $2x + 2$.

3. Find the HCF: The remaining expression, $2x + 2$, can be factored to find the HCF.

$2x + 2 = 2(x + 1)$

4. Identify the common factor: The HCF is $(x + 1)$

Vilokanam –“by observation.”

Example: square root of 961
Group: 9/61
units digit: 1 (then the unit digit of the square root will be 1 or 9)

binary digit: The square of 3 smaller than 9 is 3 (32 = 9), so the tens digit will be 3.
Possible square roots: 31 or 39

Choosing the correct square root: Multiply 3 by 4 (3 x 4 = 12). Since 12 is greater than 9, the square root with the smaller digit (31) will be correct.
Hence, the square root of 961 is 31.

Gunitasamuccayah Samuccayagunitah - states the product of the sums of the coefficients of two or more polynomials is equal to the sum of the coefficients of their product.

Example 1: Binomials

Problem: (x + 3)(x + 2)

Step 1: Sums of coefficients in factors:

Factor 1: (1 + 3) = 4 Factor 2: (1 + 2) = 3

Step 2: Product of the sums: 4 x 3 = 12

Step 3: Sum of coefficients in the product polynomial:

First, multiply the polynomials: $(x + 3)(x + 2) = x^2 + 2x + 3x + 6 = x^2 +5x+6$

Sum the coefficients: 1+5 +6 = 12

Step 4: Compare: 12 = 12, so the multiplication is correct.

THANK YOU

Late. Raja Virendra Bahadur Singh College Saraipali

Step to Vedic Maths

-By Khushboo Panda

Sutras & Sub-sutras of Vedic Maths

SUTRAS:

1.Ekadhiken Purvena
2.Nikhilam Navatacharamam Dasatah
3.Urdhva-tiryagbhyam
4.Paravartya Yojayet
5. Sunyma Samyasamuchaye
6. Sunyamanyat
7.Sankalana-vyavakalamnabyam
8. Puranapuranabhyam
9.Chalana-Kalanabhyam
10.Yavadunam
11.Vyastisamastih
12.Sesanyankena Caramena
13.Sopantyadvayamantyam
14.Ekanyunena Purvena
15.Gunitasamuccayah
16.Gunakasamuccayah

Sub-sutras

1.Anurupyena
2. Sisyate Sesajnah
3.Adyamadyenantya-mantyena
4.Kevalaih Saptakam Gunyat
5.Vestanam
6. Yavadunam Tavadunam
7. Yavadunam Tavadunikrtya Varganca Yojayet
8.Antyayoradaskaepi
9. Antyayoreva
10.Samuccayagunitha
11.Lopanasthapanabhyam
12.Vilokanam
13.Gunitasamuccayah Samuccayagunitah

SUTRAS-

Ekadhikena Purvena-

A Vedic Mathematics technique meaning "by one more than the previous," is used for various calculations, such as finding the square of numbers ending in 5 and performing special divisions.
For squares ending in 5, you take the digits to the left of the 5, add one to that number, and multiply it by the original number. The result is then followed by 25.

2x(2+1)

2×3

25

= 625

Nikhilam Navatashcaramam Dashatah-

Principle meaning "all from 9 and the last from 10". Its used to simplify calculations, especially for multiplying numbers near powers of 10.
The method involves finding the "deviation" (difference) of each number from the chosen base (e.g., 100) , then using a specific combination of subtraction and mutiplication of these deviations to find the final product.It can also be applied to subtraction from numbers like 1000 or 10000.

7X9

Urdhva Tiryagbhyam-

Principle meaning "vertically and crosswise' ana serves as a general formula for multiplying numbers of any size.
The process involves performing vertical multiplications for the units place, then diagonal multiplications and additions for the next place, and continuing this pattern of vertical and crosswise operations to derive the product, carrying over digits as needed.

Paravartya Yojayet –

Means "transfer and apply", This formula is especially used for division when the denominator is greater than a power of 10.

6534–1231399941112

2

23

65/341/12

iii

1.3999

3う

1421

677行

=53/15

9:53

R:15

227

121655

S:12

R:655

Shunyam Saamyasamuccaye –

Means "When the sum is equal, that sum is zero.

For example, to solve $9(x+3) = 4(x+3)$, you can equate the common term $(x+3)$ to zero to find $x = -3$.

SUNYAMANYAT -

Translates to "if one is in ratio, the other one is zero.

It is used to solve simultaneous
linear equations where the ratio of
the coefficients of one variable is
the same as the ratio of the
independent terms, When this
condition is met, the other variable is equal to zero, and you can then solve for the remaining variable
using either of the original
auatione

1. Identify the ratio: Look for a special relationship between the
equations. For example, in the equations $3x + 7y = 2$ and
$4x + 2ly = 6$, the ratio of the y-coefficients(7 :21) is 1 :3, which

Sankalana Vyavakalanabhyam–

A Vedic mathematics technique that means "by addition and by subtraction.Consider the equations: $45x - 23y = 113$ and $23x-45y = 91$.

Add the equations:

$(x-y=3)$

Subtract the second equation from the first:

equation from the first

$(x+y=1)$

Adding these gives $(2x=4)$, so$(x=2)$. Substituting $x=2$ into $J(xty=1$ gives $(2+y=1, 50(y=.1$.

Puranapuranabhyam–

Sutra from Vedic Mathematics that means "By completion or non-completion.

It is a technique used to solve equations, particularly quadratic, cubic, and higher-degree equations, by manipulating them to form perfect squares or cubes, or by using factorization. It also has applications in arithmetic, such as quick addition using complements.

8. Puranapuranabhyam: By the completion or non-completion.

1.Solve auadratic. biauadretic

Eg1.Qudratic equation: $X+2x-8=0$

$x^*+2x.1+12.1-8=0$

$(x+1)\ 2-9=0$

$(x+112=9$

$(x+1)\ 2=32$

$x+1 = -3 => x=.4$

$x+1 = 3 => x=2$

Chalana Kalanabhyam–

Sanskrit name for the ninth sutra in Vedic Mathematics, which means "by movement and by position" or "differences and similarities.

It is a formula primarily used for simplifying algebraic equations, especially quadratic and cubic ones, and also has applications in calculus. The sutra simplifies calculations by focusing on the incremental differences and ratios between terms.9. Chalana-Kalanabyham:

Differences and Similarities.

Solve $x2.2x-4=($

$D=6?-4ac$

$=(-2P.4.1.(4-4) \quad =20$

Differentiate $=> 2x-2=\pm\sqrt{20}$

$2x-2=+\sqrt{20}.2x-2=-/20$

$2(x-1) = +2\sqrt{5}.2(x-1) = -2/5$

$(s-.1) = +\sqrt{5}.(x-1) --/s$

$x=1+\sqrt{5}, x=1-\sqrt{5}$

Yavadunam sutra –

Vedic mathematics technique, often translated as "Whatever the extent of its deficiency/excess, "
used to find the square of a number by comparing it to a nearby power of 10, ike 10, 100, or 1000.

Example with 13

Base:10

Deficiency/Excess:

13 – 10 = +3

13 – 10 = +3

First part:

13 +3 = 16

13+3=16

Second part:

33=9

9=32

Answer: 169

Vyashtisamanstih –

An eleventh-century Vedic mathematics sutra meaning "Part and Whole, "
used for finding the ratio of a part to a whole and for breaking and combining terms in a problem.
It is applicable in various calculations, such as finding fractions of a mixture
or simplifying equations like ((2+3) (2)) by expanding it as (4+6+9)

Shesanyankena Charamena

12h sutra of Vedic Mathematics, which means "The remainders by the last digit".

- Finding remainders: This sutra can be used to find the remainder when a number is divided by 9. e
- Converting recurring decimals to fractions:It provides a quick method for converting repeating decimals to their fractional form.For example, a repeating decimal like 0.147 can be directly converted to the fraction 147
999
- Calculating the decimal value of fractions: It can be used to determine the decimal value of certain fractions, For example, the

Sopantyadvayamantyam–

Vedic mathematics sutra that translates to "the ultimate and twice the penultimate.

Equation:

E+X (C+) Z+X (C+)

(x+1) (x+4) +(x+2) (x+3)

(3+x) (2+x) 1+(4+x) (1+x) 1=(3+x) (1+x) 1+(2+x) (1+x) 1

Solution: –10/3

Ekanyunena Purvena–

Vedic mathematics sutra that means "one less than the previous" and is a shortcut for multiplication, especially when one of the numbers is a series of 9s

2.13154×99

£5-66/1-19

53 146

5346

Gunitasamuccayah–

Embodies the principle that "The sum of the product is equal to the product of the sum.

Sutra 16

गिरगतसमुफचय:

English translationis Gunitasamuccayah.

Its meaning is Productof Sum.

Its applicationis for verificationof solution of equations.

2+3x+2=0

Gunakasamuchyah –

The sum of the coefficients in the factors is equal to the sum of the coefficients in the product.

Example 1

(x+ 2) (x + 5) = ×2 + 7x+10

As is seen in the above form,

that

Sc of the product = Product of

the Sc

(1+2) (1+5) =1+7+10

3x6= 1+ 17

18 =18

SUBSUTRAS

SUB-SUTRAS

Anurupyena Sutra-

A shortcut method in Vedic mathematics for multiplication that applies
when numbers are not close to a power of 10, but are close to each other or a multiple of a base number.
6.Anurupyena: Proportionately.
Eg:46X44=Working base: 40
Multiplication base = 10x4=40
Division = 100 /2= 50
46+6
44+4
cross add
50
Product
24 (keep 4 and carry 2)
x4 (mul.base)
200 +carry 2=2024

Sisyate Sesasaminah-

Corollary of the Vedic Mathematics sutra Nikhilam Navatashcaramam Dashatah ("All from 9 and the last from 10") and means "the remainder remains constant.The Vedic math formula "Sisyate Sesasamjnah" is used for multiplication, meaning "the remainder remains constant." A
common example is 104× 101:0
1. Find the difference between each number and the base (100) :
104 - 100 = 4 and 101 - 100 =1.
2.Multiply these differences:4×1=04.
3. Add the first difference to the second number, or the second
difference to the first number: 101 + 4 1 10s (or
104+1= 105)

Adyamadyenantya-mantyena-

Vedic mathematics sutra that means "first by the first and last by the last.
For the equation
2x2+5x-3
, if a factor is found to be
Adyamadyenantyamantya to find the second
using another method like gnurupyeng, you can use
(x+3)
factor.
Divide the first term of the equa on by the first term of the
factor:2x7-x=2x.
Divide the last term of the oquation by the last term of the
factor: -3-3=-1
Combine these results to form the second factor: 2x - 1
This process is demonstrated with the example 287+5x -3.First, the middle term is split into 6x - x to get the first factor (x + 3) . Then, the Adyamadyenantyamantya sutra is opplied: @2x2÷×=2x
3÷3=-1
cond factoris 2x - 1

Kevalaih Saptakam Gunyat-

Vedic mathematics technique, a sub-sutra of the Parayartya Sutra, which means "transpose and adjust".

Vestanam Sutra-

Sub-sutra in Vedic Mathematics that means "by osculation" and is used to simplity divisibility checks, especially for numbers ending in 1, 3, 7, or 9.Positive Osculator: Used in division and multiplication where the last digit is 1.
Negative Osculator: Used when the last digit of the divisor is not 1, requiring multiplication to make it 1.
• Example: To check if 343 is divisible by 7, you find the negative
osculator by multiplying 7 by 3 to get 21.The negative osculator is 2.Then you use this osculator and the last digit to determine if 343 is divisible by 7. @

Yavadunam Tavadunam Sutra–

10 (like 10, 100, 1000) .
Vedic mathematics technique for squaring numbers close to a power of
Example: 98?

1. Deficiency:98 – 100 = –2.
2. Square the deficiency:(–2)² = 4.
3. Subtract the deficiency from the number: 98 – 2 = 96.
4. Combine: 9604 (using two digits for the deficiency part because the base is 100)

Yavadunam Tavadunikrtya

Vargancha Yojayet.

Is a formula in Vedic mathematics that is used to find the squares of numbers that are close to powers of 10 (10, 100, 1000, etc.) . This means, subtract its deficiency from the number and write the square of that deficiency.

SQUARE OF 8
10 – 8 = 2, SQUARE OF 2 is 4
8 – 2 = 6
THus, SQUARE OF 8 = 64

Antyardeshkepi–

A term that refers to the Vedic mathematics method Antyayordasake's pi, also known as Antyardeshkepi, used for multiplication.
It's a technique where the sum of the unit digits is 10, and the preceding
digits are the same, The multiplication is done by multiplying the preceding
digits with one more than that digit, and then multiplying the unit digits together.1. ldentty the numbors: Uhe twonunbers where the sum of the las dgis is 10 and the other digts are the same
leg. 24×20) , ∘ 2. lut purto thenswern unpy meron.untdgtbycanemor
than iteol
· 24x26 menmmunt dg\2
·Multijpy2x(2+1) =2x3=6.0
3. Roht part of theanswer.wumepytheunt ágits togeter
For 24x26, The unit digits are 4 and

Antyayoreva –

A Vedic Mathematics sutra meaning "only the last terms" or "only the last digits".
Multiplication Application (e.g., by 1)
When multiplying anumber by 11, this sutra provides a
shortcut:
1. Wite the last digit of the number asis
2. Add the last diglt to the next digilt to its left, and place this sum between them.
3. Continue thls process, addingadjacent digits untl the first dilgit of
the original number is reached
Example: To multiply 35 by 11:01. Write the last diait, 5.
2. Add 3+5 =8, andplacelitbefore the 5
3. Wite the first digit, 3, before the 8.
4. The result is 385.

Samuccayagunitah –

Vedic mathematics sub-sutra that means "the product of the sums" or the sum of the products," used to verify calculations.
· Example: For the multijplication (x + 3) (x + 2) , the sum of the coefficients in the factorsis (1 +3) ×(1+2) =4×3=12.The product is .xP + 5r + 6, and the sum of its coefficients is
1+5+6=12, which confirms the result

lopanasthapanabhyam –

Vedic mathematics sutra that means "by alternate elimination and retention.
It is used to solve problems by alternately eliminating one variable to solve for the remaining ones, and it can be applied to problems like factorization of quadratic equations, finding the Highest Common Factor (HCF) , and solving simultaneous equations.
• Example 1: Find the HCF of x7+ 5x +4andx2+7x+6.
· Method: Subtract the two expressions.•Calculation:
·(22+7x+6) −(82+5x+4) =2x+2
· Result: The HCFis (x + I) , whichis a factor of both 2x + 2 and
the original polynomials
Examole: Factor the exoressior
38479+29411824702+62?.
◦ Method: Tomporarly set one varlable to zero to roduce the
problem
◦ Step1:Put z = 0.The expressionbecomes307+7xy+20?◦ Step 2: Factor the resultinaauadratic expression, which aives (3x +y) (x+2y) .
◦ Stop 3: Wth y = 0, the original expression become
341182462.hls factors to (3x +22) (× +.32) .
◦ Step 4:With x = 0 the exprossionbecomes 27+7yz+622This factors to (2y+32) (y+ 2z)

Vilokanam –

Vedic mathematics concept that means "by mere observation" and is used for two main purposes: fast addition (also called spark addition) and finding the square root of perfect squares

Example: Finding the square root of 2116

1. Group the digits: Starting from the right, group the digits Inpairs: 21 16. 0

2. Find the unit digit: Look at the unit digilt of the last group (16) , which is 6. The unit dlgit of the square root will be elther 4 or 6, because 43 = 16and67 = 36. @

3. Find the tens digit: Look at the frst group (21) . Find the largest number whose square is less than or equal to 21. This is 4 (42 = 16) . So, the tens digit of the square root is 4.@

4. Determine the possible roots: Based on steps 2 and 3, the possible square roots are 44 or 46. 0

5. Choose the correct root: To declde between 44 and 46, find the square of a number ending in S between them, which is 45. Calculate 457 = 2025. Since the original number, 2116, is greater than 2025, the square root must be the larger of the two options. o

6. Final Answer: The square root of 2116is 46. 0

Gunita samuchaya samuchay gunita –

A Vedic mathematics principle that means "the product of the sums of the coefficients of the factors equals the sum of the coefficients of the product.

• Example:(x+1) (x+2) (x+3) =8* +6x7 +11x+6.

• Check:

· Sum of coefficients of factors;

(1 + 1) (1 +2) (1+3) =(2) (3) 1(4) =24. 0

Thank You

INTRODUCTION TO VEDIC MATHS

BY- PUREN PATEL

VEDIC MATHS

“Vedic” means “from the Vedas,” the ancient Indian scriptures.

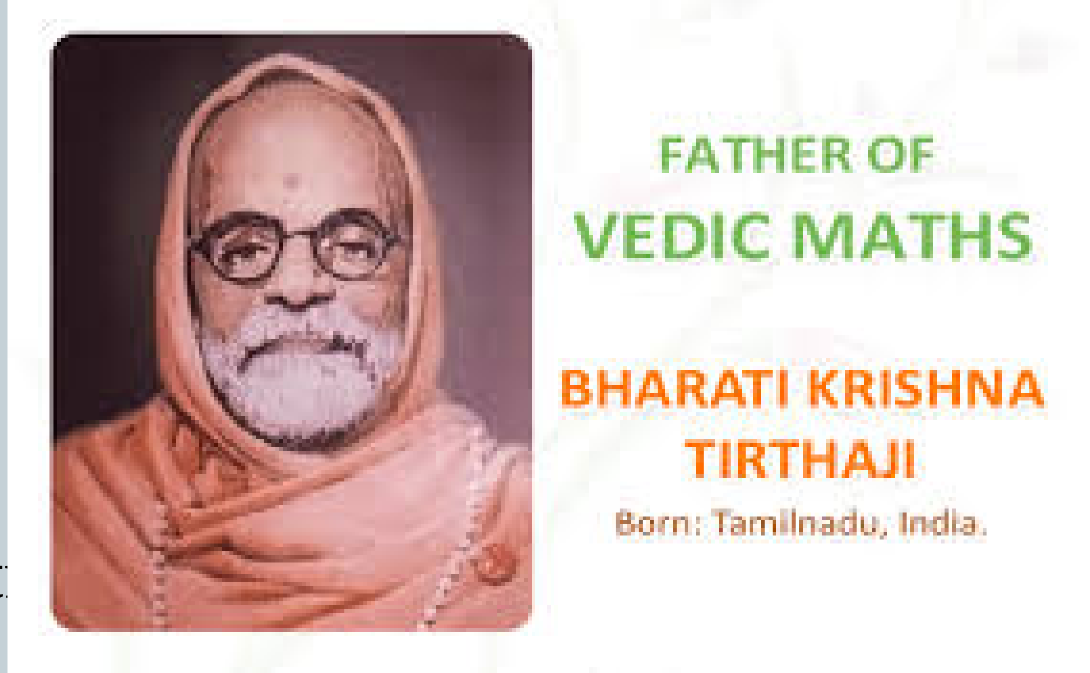
Vedic Maths was rediscovered by Swami Bharati Krishna Tirthaji in the early 20^{th} century.

It uses simple rules and patterns to solve difficult problems easily.

It helps in doing mental maths quickly.

Importance of Vedic Maths

1. Makes calculations fast and accurate.
2. Builds concentration and memory.
3. Reduces dependence on calculators.
4. Helpful for competitive exams.
5. Makes learning maths fun and interest



Vedic Maths Sutras

Sutras

1. Ekadhiken Purvena
2. Nikhilam Navatacharamam Dasatah
3. Urdhva-tiryagbhyam
4. Paravartya Yojayet
5. Sunyma Samyasamuchaye
6. Sunyamanyat
7. Sankalana-vyavakalamnabyam
8. Puranapuranabhyam
9. Chalana-Kalanabhyam
10. Yavadunam
11. Vyastisamastih
12. Sesanyankena Caramena
13. Sopantyadvayamantyam
14. Ekanyunena Purvena
15. Gunitasamuccayah
16. Gunakasamuccayah

Sub-sutras

1. Anurupyena
2. Sisyate Sesajnah
3. Adyamadyenantya-mantyena
4. Kevalaih Saptakam Gunyat
5. Vestanam
6. Yavadunam Tavadunam
7. Yavadunam Tavadunikrtya Varganca Yojayet
8. Antyayoradaskaepi
9. Antyayoreva
10. Samuccayagunitha
11. Lopanasthapanabhyam
12. Vilokanam
13. Gunitasamuccayah Samuccayagunitah

THE SUTRAS-

1. Ekadhikena Purvena: By one more than the previous one.

$35^2 = 1225$

12 / 25

Part I- one more than the previous one

$3+1= 4 \qquad 3 \times 4 = 12$

Part II – (SECOND Number)^2

$5^2 = 25$

Nikhilam Navatashcaramam

Dashatah: All from 9 and the last from 10.

100000 - 43658 = 056342

Step1: Need to subtract 5 digits, so separate 5 digits as one part, remaining is part two

1 / 00000

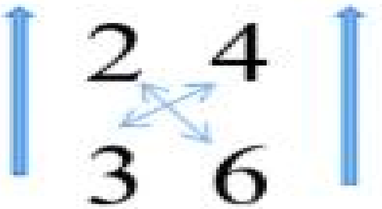
Step 2: Subtract 1 from first part,

Step3: Sub first four digits from 9, last digit from 10.

3. Urdhva-Tiryagbhyam:

Vertically and crosswise.

24 x 36 = 864



Step1: Last digits : (right) multiply vertically

4 x 6 = 24 . keep 4 carry over 2

Step2: Cross product (2x6)+(3x4) = 24.

keep 4 & add the last carry over

Step3: First digits: (left) multiply vertically and add the last carry over (2x3)+2 =8

4. Paraavartya Yojayet:

Transpose and apply.

2587 ÷ 112

```
112  | 2 5 8 7
-1-2 |   -2-4
     |       -3  -6
     ----------------
       2 3 4   1
```

Quotent and Remainder -23 and 41

No.of digits in quotient = (diff .b/t no.of digits in dividend and divisor) + 1

289487 ÷ 13103

```
13103    | 2 8 9  4  8 7
-3-10-3  |   -6-2 0-6
         |      -6-2 0-6
         ------------------
           2 2 1  2  21
```

Quotent and Remainder - 22 and 1221

5. Shunyam Saamyasamuccaye:

Meaning3: Samuccaye means sum of the denomenators, when the numerators are same.

Eg: $\frac{1}{3x-1}+\frac{1}{4x-1}=0$

The numerators are same, Add the denominators and put =0

$$(3x-1)+(4x-1)=0$$

$$7x-2=0$$

$$x=2/7$$

5. Shunyam Saamyasamuccaye:

Meaning4: Samuccaye means combination -> if the sum of the denomenators is equal to the numerators then equate that sum to zero

.Eg: $\frac{2x+5}{2x+11} = \frac{2x+11}{2x+5}$

Sum of numerators = 2x+5+2x+11 = 4x+16

Sum of denomenators = 2x+11+2x+5 = 4x+16

Equate that sum to zero 4x+16=0 => x = - 4

6. VYASTI SAMASTIH-individuality or the part, while Samashti means collectivity or the whole.

Example 1
58 x 62 = 3,596

From the above question, we find that 60 can be chosen as an average value for 62 and 58. And 62 is 4 numbers higher than 58, and for 62, it is 4 less than the number 58. Halving the difference, it is 4/2 = 2

So,

Step 1: Square the average value (here it is 60): 60 x 60 = 3600
Step 2: Square the halved difference (here it is 2): 2 x 2 = 4 (i.e., 62 – 58 = 4)
Step 3: Subtracting the above results got from Step 1 and Step 2, we get 3600 – 4 = 3,596
Therefore , 58 x 62 = 3,596

7.Sankalana-Vyavakalanabhyam:

By addition and by subtraction.

Eg1: Single digit add 43+ 8

43+10-2 = 53-2=51

Eg2: Double digit add 33+19

33+20-1 = 53-1= 52

Eg3: Subtract 55-9 = 55-10 +1 = 45 +1= 46

Eg4: 3 digit add 105+129

100+129+5= 229+5 = 234

8. Puranapuranabhyam: By the completion or non-completion.

1. Solve quadratic, biquadratic

Eg1: Qudratic equation: $x^2 + 2x - 8 = 0$

$$x^2 + 2x.1 + 1^2 - 1 - 8 = 0$$

$$(x+1)^2 - 9 = 0$$

$$(x+1)^2 = 9$$

$$(x+1)^2 = 3^2$$

$$x+1 = -3 \Rightarrow x = -4$$

x

$$x + 1 = 3 \Rightarrow x = 2$$

Eg2: CUBIC EQUATION $x^3 + 6x^2 + 11x + 6 = 0$

compare $x^3 + 3.x^2.2 + 11x + 6 = 0$ & $a^3 + 3.a.b.(a+b) + b^3 = 0$

$x^3 + 3.x.2.(x+2) + 2^3 - 8 - 3.x.4 + 11x + 6 = 0$

$(x+2)^3 - 2 - 12x + 11x = 0$

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

$(x+2)^3 = (x+2) \Rightarrow a^3 = a \Rightarrow a(a^2-1) = 0$

$\Rightarrow a=0,\ a=1,\ a=-1$

$a=0 \Rightarrow x+2=0 \Rightarrow x=-2$

$a=1 \Rightarrow x+2=1 \Rightarrow x=-1$

$a=-1 \Rightarrow x+2=-1 \Rightarrow x=-3$ Solutions $x = -2, -1, -3$

9. Chalana-Kalanabyham:

Differences and Similarities.

Solve $x^2 - 2x - 4 = 0$

$D = b^2 - 4ac$

$= (-2)^2 - 4.1.(-4) = 20$

Differentiate => $2x-2 = \pm\sqrt{20}$

$2x-2 = +\sqrt{20}$, $2x-2 = -\sqrt{20}$

$2(x-1) = +2\sqrt{5}$, $2(x-1) = -2\sqrt{5}$

$(x-1) = +\sqrt{5}$, $(x-1) = -\sqrt{5}$

$\mathbf{x = 1 + \sqrt{5}}$, $\mathbf{x = 1 - \sqrt{5}}$

10. Yaavadunam: Square its deficiency, Whatever the extent of its deficiency.

Find the squares between 1 to 100

Eg: $94^2 = (94\text{-}6)^2$

$= 88 \mid 6^2$

$= 8836$

Find the squares more than 100

$102^2 = (102+2)^2$ 102-100= 02

$= 102 \mid 02^2$

$= 102\ 04$

Squaring from 969 to 999

$969^2 = (969\text{-}31) \mid 31^2$ 1000-969= 31

$= 938 \quad 961$

11. Shesanyankena Charamena: The remainders by the last digit.

Converting recurring decimal to fractions

	Quotient	remainde r	x7	last digit
1/7				
10/7	1	3	21	1
30/7	4	2	14	4
20/7	2	6	42	2
60/7	8	4	28	8
40/7	5	5	35	5
50/7	7	1	07	

1/7= 0.142857

12. Sopaantyadvayamantyam:

The ultimate and twice the penultimate.

Ultimate + Twice the penultimate (U+2P)

624 X 12 = -----

Step1: make a sanwitch number with zero

0 6 2 4 0

P U

U+2P => (6+(2X0)) (2+(2X6)) (4+(2X2)) (0+(2X4))

=> 6 14 8 8 => 7 4 8 8

13.Ekanyunena Purvena: By one less than the previous one.

9999 x 2378 = 23777622

2377 / 7622

Part I- One less than 2378 is 2377

Part II – (9-2)(9-3)(9-7)(9-7) = 7622

14. Gunitasamuccayah:

The Product of the sum of the coefficient is equal the sum of the coefficient in the product.

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

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

coefficient of x^2 is 1

coefficient of x is 5

const.coefficient is 6

sum of the coefficient is 1+5+6= 12 --(I)

Higher degree coefficent is 1, substitute 1 in factors (1+3)(1+2) = 4x3=12 ---(II)

15. **Gunakasamuccayah:**

The factors of the sum are the same as the sum of the factors.

$x^2+5x+4=(x+4)(x+1)$

$2x+5=(x+4)+(x+1)$

The factors of the sum are the same as the sum of the factors.

16. Dhvajanka: Flag.

Division 74862 ÷ 73

7^3 | $74_1 8_4 6\ {}_5 2$

3 0 6 15

1 18 40 37

quotient **1025**

QUOTIENT = 1025
Remainder =37

Step1: 7/7= quotient 1
Step2: 3x1 =3
Step3: 4-3=1
Step4: 1 / 7= quotient 0, remainder 1
Step5: 3 x 0 =0
Step6: 18-0 =18
Step 7: 18/7= quotient 2, remainder 4
Step 8: 3 x 2 =6
Step 9: 46-6 =40
Step10: 40/7= quotient 5, remainder 5
Step11: 3x5=15

THE SUBSUTRAS-

ANURUPYENA – WHICH MEANS PROPORTIONATELY

Suppose we have to multiply 468 by 480:
Since both these numbers are far away from 1000, we take 1000 as our theoretical base and 1000/2 = 500 as our working base
We then work-out the multiplication as before and to the answer obtained, we divide the left-hand portion of the result in the same proportion as our theoretical base is to the working base (in this example divide by 2)

(468 * 480)

	(1000/2 = 500)	
468	-32	
480	-20	

448	640	
/2		

224	640	= 224640

"SISYATE SESAJNAH"- WHAT REMAINS IS CALLED THE REMAINDER.

Problem: Factor x ^ 2 + 5x + 6

Application: The sutra Adyamadyenantya-mantyena is used to find the first and last terms of the factors.

The first term of the factors is the square root of the first term of the expression, which is x(x.x = x ^ 2)

The last term of the factors is found by looking for two numbers that multiply to 6 and add up to 5 (the middle term).

Solution: The two numbers are 2 and 3 because 2 * 3 = 6 and 2 + 3 = 5. Therefore, the factors are (x + 2) and(x + 3)

"Adyamadyenantya-mantyena"- The first by the first and the last by the last

- Example: To find the area of a rectangle with a length of 6'4" and a width of 5'8", you would apply the sutra.
  Multiply the first parts: 6 x 5 = 30 (representing 30 square feet).
  Multiply the last parts: 4 × 8 = 32 (representing 32 square inches).
  Combine the results: The area is 30 square feet and 32 square inches. This method is a shortcut to avoid more complex conversion and multiplication, but further steps may be needed if the inches exceed 12 (as explained in the source)

Kevalaih Saptakam Gunyat-For seven the multiplicand is 143

Application to fractions:

1/7=0.142857….

While 143 is used, the actual number to remember is 142857

This number is cyclic, meaning the decimal expansions of 2/7, 3/7, 4/7, 5/7, and 6/7 are just permutations of these digits.

How it works: The number 143 acts as a memorable anchor for the repeating pattern 142857. By remembering this sequence, one can quickly calculate the decimal value for any fraction with a denominator of 7.

Vestanam Sutra-by OscUlation

Osculators: There are two types:
Positive Osculator: Used with a divisor ending in 9 (e.g., the osculator for 19 is 1).
Negative Osculator: Used with a divisor ending in 1 (e.g., the osculator for 11 is -1).

Examples of using Vestanam-

Finding the positive osculator for 13:

The positive osculator for 13 is 4.
This is calculated by taking the last digit (3), multiplying it by 4 to get 12, and then adding 1 to the first digit (1) to get 2. 1 becomes 2, 3 becomes 2, resulting in 22. This process is repeated until the remainder is 1.

Finding the negative osculator for 19:

The negative osculator for 19 is 2.

This is calculated by taking the last digit (9), multiplying it by 2 to get 18, and then subtracting 1 from the first digit (1) to get 0. 1 becomes 0, 9 becomes 8, resulting in 08, or 8. This process is repeated until the remainder is 1.

"Yavadhunam Tavadhunam"-As much as is subtracted, so much is given.

For example, the square of 99 is 1 less than 100.
If you subtract 1 from 99, you get 98.
Multiplying 1 by 1 gives 1.
Therefore, the square of 99 is 9801.

Yavatinam tavathunikritya varganja yojayet”

Example: square of 98

1. Find the defect: 100-98 = 2.

2. Subtract the minus from the number: 98-2 = 96. This is the first part of the square.

3. Find the square of the defect: 22 = 4. This is the last part of the square.

4. Conclusion: 964. Therefore, 982 = 9604 (i.e., 96 and 04 should be written together).

sum of the unit digits is 10 and the other digits are the same.

Example: 32 x 38

1. Check the conditions: The last digits, 2 and 8, sum to 10. The preceding digits, 3 and 3, are the same.

2. Calculate the right part: Multiply the last digits: 2 x 8 = 16. This is the right part of your answer.

3. Calculate the left part: Take the preceding digits, 3. Add 1 to it to get 4. Multiply these two numbers: 3 x 4 = 12. This is the left part of your answer.

4. Combine the parts: Place the left part before the right part to get the final answer: 1216.

Antyayoreva -"only the last terms" or "only the last digits".

Example: To multiply 35 by 11:

1. Write the last digit, 5.

2. Add 3 + 5 = 8, and place it before the 5.

3. Write the first digit, 3, before the 8.

4. The result is 385.

Samuccayagunitah-"The sum of the coefficients in the product".

Example:

Factors: (x + 3)(x + 2)

Sum of coefficients in factors: (1+3) and (1+2)

Product of the sums of coefficients: (4)(3) = 12
Product of factors: $x^2 + 5x + 6$
Sum of coefficients in product: 1+5+6=12

Application: This sub-sutra is also known as "Gunitasamuccayah Samuccayagunitah" and can be used for biquadratic and cubic equations as well.

Lopanasthapanabhyam

This method is used in Vedic mathematics to find the highest common factor (HCF) of polynomials.
Steps for finding the HCF of $x^2 + 7x + 6$ and $x^2 + 5x + 4$

1. Subtract the polynomials: Subtract the second polynomial from the first to eliminate the highest power term (x^2).
$(x^2 + 7x + 6) – (x^2 + 5x + 4)$
2. Simplify the expression: This results in $2x + 2$.
3. Find the HCF: The remaining expression, $2x + 2$, can be factored to find the HCF.
$2x + 2 = 2(x + 1)$
4. Identify the common factor: The HCF is $(x + 1)$

Vilokanam –"by observation."

Example: square root of 961
Group: 9/61
units digit: 1 (then the unit digit of the square root will be 1 or 9)

binary digit: The square of 3 smaller than 9 is 3 (32 = 9), so the tens digit will be 3.
Possible square roots: 31 or 39

Choosing the correct square root: Multiply 3 by 4 (3 x 4 = 12). Since 12 is greater than 9, the square root with the smaller digit (31) will be correct.
Hence, the square root of 961 is 31.

Gunitasamuccayah Samuccayagunitah - states the product of the sums of the coefficients of two or more polynomials is equal to the sum of the coefficients of their product.

Example 1: Binomials

Problem: $(x + 3)(x + 2)$

Step 1: Sums of coefficients in factors:

Factor 1: $(1 + 3) = 4$ Factor 2: $(1 + 2) = 3$

Step 2: Product of the sums: $4 \times 3 = 12$

Step 3: Sum of coefficients in the product polynomial:

First, multiply the polynomials: $(x + 3)(x + 2) = x^2 + 2x + 3x + 6 = x^2 + 5x + 6$

Sum the coefficients: $1 + 5 + 6 = 12$

Step 4: Compare: $12 = 12$, so the multiplication is correct.

THANK YOU

A Presentation on Vedic Maths

By: Bhavesh Kumar Barhai

वैदिक गणित

वैदिक गणित गणितीय तकनीकों की एक प्राचीन भारतीय प्रणाली है,जो वेदों से ली गई है, जो गणनाओं को सरल बनाकर उन्हें तेज़और आसान बनाती है।

यह 16 सूत्रों (शब्द-सूत्रों) और 13 उप-सूत्रों के एक समूहपर आधारित है, जोअंकगणित,

बीजगणित, ज्यामिति और अन्य संक्रियाओं को करने के लिए व्यवस्थित और लचीली विधियाँ प्रदान करते हैं, जिनमें अक्सर मानसिक गणना का उपयोग किया जाता है।

भूमिका

वैदिक गणित का महत्त्व बहुत अधिक है।
यह गणना की प्रक्रिया को तेज़ और सरल बनाता है।
इससे विद्यार्थी मानसिक रूप से गणना करने में दक्ष बनते हैं।
यह तार्किक सोच और एकाग्रता को बढ़ाता है।
प्रतियोगी परीक्षाओं में समय बचाने में यह बहुत उपयोगी है।
वैदिक गणित भारतीय प्राचीन ज्ञान की महान वैज्ञानिक परंपरा को दर्शाता है।

वैदिक गणित के सूत्र तथा उपसूत्र

testbook

Vedic Maths Sutras

Sutras

1. Ekadhiken Purvena
2. Nikhilam Navatacharamam Dasatah
3. Urdhva-tiryagbhyam
4. Paravartya Yojayet
5. Sunyma Samyasamuchaye
6. Sunyamanyat
7. Sankalana-vyavakalamnabyam
8. Puranapuranabhyam
9. Chalana-Kalanabhyam
10. Yavadunam
11. Vyastisamastih
12. Sesanyankena Caramena
13. Sopantyadvayamantyam
14. Ekanyunena Purvena
15. Gunitasamuccayah
16. Gunakasamuccayah

Sub-sutras

1. Anurupyena
2. Sisyate Sesajnah
3. Adyamadyenantya-mantyena
4. Kevalaih Saptakam Gunyat
5. Vestanam
6. Yavadunam Tavadunam
7. Yavadunam Tavadunikrtya Varganca Yojayet
8. Antyayoradaskaepi
9. Antyayoreva
10. Samuccayagunitha
11. Lopanasthapanabhyam
12. Vilokanam
13. Gunitasamuccayah Samuccayagunitah

1) “एकाधिकेन पूर्वेण” सूत्र की परिभाषा:
यह वैदिक गणित का सूत्र है जिसका अर्थ है “पूर्व संख्या से एक अधिक”।

इसका उपयोग मुख्य रूप से दो प्रकार के गणनाओं में किया जाता है

1. किसी संख्या को 11 से गुणा करने में, जहाँ प्रत्येक अंक के बीच उनके योग को रखा जाता है।
2. 5 पर समाप्त होने वाली संख्याओं के वर्ग (square) निकालने में, जहाँ पहले अंक को उसके एक अधिक अंक से गुणा किया जाता है और अंत में 25 जोड़ा जाता है।

उदाहरण

सूत्र: एकाधिकेन पूर्वेण

अर्थ: ‘पूर्व संख्या से एक अधिक’

उपयोग 1: 11 से गुणा करने में

$$23 \times 11 = ?$$

$$2 \times \boxed{5}$$

$$2\,(5)\,3 = 253$$

- उत्तर = 253

उपयोग 2: 5 से समाप्त होने वाली संख्याओं के वर्ग निकालने में

$$45^2 = ?$$

$$4 \times 5 = 20$$

$$3 = 25$$

- उत्तर = 2025

2) निखिलं नवतश्चरमं दशतः

इस सूत्र का अर्थ है —
“सभी 9 से और अंतिम 10 से घटाओ।”
अर्थात् जब किसी संख्या का गुणन या भाग किसी 10, 100, 1000 आदि के पास की संख्या से करना हो, तब यह सूत्र बहुत उपयोगी होता है।

इसमें हर संख्या को 10, 100, 1000 जैसी "base" संख्या के सापेक्ष उसके अंतर (difference) के रूप में लिया जाता है, फिर एक सरल गुणा-घटाव से परिणाम निकाला जाता है।

उदाहरण:

97 × 94 = ?

Base = 100

Deficit: (–3) और (–6)

Cross-subtraction: 97 – 6 = 91

Deficits का गुणन: (–3)(–6)=18

उत्तर: 9118

3) ऊर्ध्व–तिर्यग्भ्याम सूत्र

परिभाषा:
“ऊर्ध्व–तिर्यग्भ्याम” वैदिक गणित का एक अत्यंत प्रसिद्ध सूत्र है, जिसका अर्थ है ‘ऊर्ध्व’ = ऊपर से और ‘तिर्यग्भ्याम’ = आड़े से या तिरछे से।
यह सूत्र गुणा करने की एक ऐसी विधि बताता है जिसमें संख्याओं को ऊपर-नीचे और आड़े-तिरछे गुणा किया जाता है।
इससे बड़ी संख्याओं का गुणन बहुत ही तेज़ी और सरलता से किया जा सकता है।

उदाहरण:

23 × 12 = ?

→ Step 1: 3×2 = 6

→ Step 2: (2×2)+(3×1)=7

→ Step 3: 2×1=2

उत्तर: 276

4)परावर्त्य योजयेत् सूत्र

परिभाषा:
“परावर्त्य योजयेत्” वैदिक गणित का एक प्रमुख सूत्र है।
इसका अर्थ है — “परावर्त्य” अर्थात उलटकर या परिवर्तित करके और “योजयेत्” अर्थात जोड़ना।
यह सूत्र मुख्यतः भाग करने तथा बीजगणितीय समीकरणों को हल करने में प्रयोग किया जाता है।
जब कोई संख्या या पद सीधे भाग नहीं देता, तब उसे उलटकर या परिवर्तित करके जोड़ दिया जाता है।
उदाहरण: 1/19 का दशमलव निकालने में उपयोग होता है।
यह क्रमिक पुनरावृत्ति विधि से तेजी से उत्तर देता है।

5)शून्यं साम्यसमुच्चये सूत्र

परिभाषा:

“शून्यं साम्यसमुच्चये” वैदिक गणित का एक अत्यंत महत्वपूर्ण सूत्र है।
इसका अर्थ है — “जहाँ साम्य (बराबरी) हो, वहाँ समुच्चय (योग) शून्य होता है।”
अर्थात् जब किसी समीकरण के दोनों पक्षों (LHS और RHS) में समान पदों का
योग (समुच्चय) आता है
तो वे एक-दूसरे को निरस्त (cancel) कर देते हैं और शेष भाग को शून्य के बराबर माना जाता है।

उदाहरण

समीकरण: $9(x+3)=4(x+3)$

शून्यं साम्यसमुच्चये सूत्र का उपयोग: यहाँ $(x+3)$ दोनों पक्षों में एक उभयनिष्ठ पद है।
सूत्र के अनुसार, हम $(x+3)$ को शून्य के बराबर रख सकते हैं। $x+3=0$ $x=-3$

6. आनुरूप्ये शून्यमन्यत् (Anurupyena Shunyam Anyat)

अर्थ: “अनुपात में एक पद शून्य होगा।”
उपयोग: अनुपात और समीकरण हल करने में।

उदाहरण:
यदि (a/b) = (c/d), तो a, b, c, d में से कोई एक पद शून्य भी हो सकता है जिससे समीकरण सरल हो।

7. संकलन-व्यवकलनाभ्याम् (Sankalana Vyavakalanabhyam)

अर्थ: “जोड़ और घटाव से।”

उपयोग: रैखिक समीकरण (Linear equations) में।

उदाहरण:

$x + y = 10$

$x - y = 2$

जोड़ें → $2x = 12$ → $x = 6$

घटाएँ → $2y = 8$ → $y = 4$

उत्तर: $x = 6, y = 4$

8. पूरणापूरणाभ्याम् (Puranapuranabhyam)

अर्थ: “पूरक और अपूर्णता से।”

उपयोग: 10, 100 के पूरक लेकर तेज गुणा करने में।

उदाहरण:

46 × 54 = ?

दोनों 50 के पास हैं → +4 और −4

Cross-subtraction: 46 + 4 = 50

Product of deviations: (4)(−4)=−16

उत्तर: 50×100 + (−16)= 2484

9. चलन-कलनाभ्याम् (Chalana Kalanabhyam)

अर्थ: “गति और गणना द्वारा।”
उपयोग: कलन (Calculus) या समीकरणों में परिवर्तन ज्ञात करने में।

उदाहरण:
यदि $y = x^2$, तो $dy/dx = 2x$
यह सूत्र differential calculus की मूल भावना दर्शाता है।

10. यावदूनं तावदूनिकृत्य वर्गं च योजयेत्
(Yavadunam Tavadunikritya Vargam Cha Yojayet)

अर्थ: “जितना घटा है, उतना घटाकर उसका वर्ग जोड़ दो।”
उपयोग: base से थोड़ी कम संख्या का square निकालने में।

उदाहरण:
$98^2 = (100 - 2)$
→ $(98 - 2)|(2^2)$
उत्तर: 9604

11. व्यष्टि-समष्टिः (Vyastisamasthih)

अर्थ: “भाग और समष्टि का संबंध।”

उपयोग: Polynomial विस्तार और बीजगणितीय अभिव्यक्तियों में।

उदाहरण:

$(a + b)^2 = a^2 + 2ab + b^2$

यह सूत्र इस सिद्धांत पर आधारित है।

12. शेषान्यङ्केन चरमेण (Shesanyankena Charamena)

अर्थ: “अंतिम अंक से शेष निकालो।”
उपयोग: भागशेष (Remainder) ज्ञात करने में।

उदाहरण:
किसी संख्या की 9 से विभाज्यता जांचने हेतु उसके सभी अंकों का जोड़ करें।
यदि योग 9 से विभाज्य है, तो संख्या भी विभाज्य

13. सोपान्त्यद्वयमन्त्यम् (Sopantyadvayamantyam)

अर्थ: “अंतिम दो अंकों का प्रयोग।”
उपयोग: किसी श्रेणी या गुणन में अंतिम दो पदों से परिणाम ज्ञात करना।

उदाहरण:
एक अंकगणितीय श्रेणी में अंतिम दो पदों का औसत × पदों की संख्या = कुल योग।

14. एकान्यूनेन पूर्वेण (Ekanyunena Purvena)

अर्थ: “पूर्व संख्या से एक कम।”
उपयोग: 9 या 99 पर समाप्त संख्याओं के वर्ग में।

उदाहरण:
$99^2 = ?$
→ $99 \times (99 - 1) = 99 \times 98 = 9702$
→ अंत में $1^2 = 01$ जोड़ो
उत्तर: 9801

15. गुणितसमुच्चयः (Gunita Samuccayah)

अर्थ: “गुणनफल समान होने पर उत्तर समान।”
उपयोग: Polynomial या समीकरण तुलना में।

उदाहरण:
$(x+1)(x+2) = (x+3)(x-2)$
दोनों ओर गुणा करके समान गुणनफल की जांच से हल प्राप्त किया जा सकता है।

16. गुणकसमुच्चयः (Gunakasamuccayah)

अर्थ: “गुणकों का समुच्चय समान।”

उपयोग: अनुपात और समीकरण में जब गुणक समान हों।

उदाहरण:

यदि 2x = 6y, तो x/y = 3/1

गुणकों की समानता से अनुपात ज्ञात किया जा सकता है।

उपसूत्र

1. अनुरूप्येण (Anurupyena)

अर्थ: समानुपातिक रूप में या समान अनुपात से।

परिभाषा: जब कोई संख्या किसी अन्य संख्या के अनुपात में हो, तो उसी अनुपात से गणना सरल की जा सकती है।

उदाहरण:

यदि 8 × 75 निकालना हो →

= 8 × (3/4 × 100)

= (8 × 3/4) × 100 = 6 × 100 = 600

2. शिष्यते शेषसंज्ञः (Shisyate Sheshajnah)

अर्थ: शेष ही उत्तर बताता है।

परिभाषा: भागफल के बाद बचा हुआ शेषांश (remainder) ही परिणाम का संकेत देता है।

उदाहरण:

यदि 10 को 3 से भाग दें → भागफल 3, शेष 1

शेष (1) से पता चलता है कि $10 = 3 \times 3 + 1$

3. आद्यमाद्येनान्त्यमान्त्येन

(Adyamadyenāntyamāntyena)

अर्थ: प्रारंभिक को प्रारंभिक से और अंतिम को अंतिम से जोड़ो।

परिभाषा: गुणा करते समय पहले और अंतिम अंकों को अलग-अलग जोड़कर परिणाम बनाना।

उदाहरण:

23 × 41 →

(2×4) | (3×1) = 8 | 3 → 83

4. केवलैः सप्तकं गुण्यत् (Kevalaih Saptakam Gunyat)

अर्थ: केवल 7 से गुणा करो।

परिभाषा: जब किसी गणना का संबंध 7 से हो (जैसे भाग या गुणा), तो केवल आवश्यक अंश को 7 से गुणा करना पर्याप्त होता है।

उदाहरण:

यदि किसी संख्या का 1/7 निकालना है →

14 का 1/7 = 14 ÷ 7 = 2

5. वेष्टनम् (Veshtanam)

अर्थ: लपेटना या घेरना।

परिभाषा: किसी संख्या या श्रेणी को इस तरह “घुमाकर” या “लपेटकर” जोड़ा या घटाया जाए कि गणना सरल हो जाए।

उदाहरण:

9 का गुणनफल प्राप्त करने हेतु —

$5 \times 9 = (5 \times 10) - 5 = 45$

6. यावदूनं तावदूनम् (Yavadūnam Tavadūnam)

अर्थ: जितना घटा, उतना ही घटाओ।
परिभाषा: जब कोई संख्या किसी बेस (10, 100 आदि) से कुछ कम हो, तो उसी मात्रा से घटाकर गणना करें।
उदाहरण:
$98^2 = (100-2)^2 = (98-2)|2^2 = 9604$

7. यावदूनं तावदूनिकृत्य वर्गं च योजयेत्
(Yavadūnam Tavadūnikritya Vargam Cha Yojayet)

अर्थ: जितना घटा, उतना घटाकर उसका वर्ग जोड़ो।
परिभाषा: बेस के करीब संख्याओं के वर्ग के लिए उपयोगी।
उदाहरण:
$97^2 = (97-3)|(3^2) = 9409$

8. अन्त्ययोर्दशकेऽपि (Antyayor Dasake’pi)

अर्थ: अंतिम दो अंकों के 10 बनाने पर आधारित।

परिभाषा: जब दो संख्याओं के अंतिम अंक मिलकर 10 बनाते हैं और उनके पहले अंक समान हों, तो सरल गुणा किया जा सकता है।

उदाहरण:

43 × 47 →

पहला अंक 4 समान, अंतिम अंकों का योग 10

= (4×5)|3×7 = 2021

9. अन्त्ययोरेव (Antyayoreva)

अर्थ: केवल अंतिम दो अंकों पर कार्य करें।

परिभाषा: कुछ विशेष गणनाओं में केवल अंतिम अंकों पर ध्यान देकर पूरा परिणाम मिल जाता है।

उदाहरण:

25 × 25 → अंतिम अंक 5

→ (2×3)|25 = 625

10. समुच्चयगुणितः (Samuccayagunitaḥ)

अर्थ: योग का गुणनफल।

परिभाषा: जब किसी समीकरण में योग या समुच्चय का गुणन होता है तो कुल योग को एक साथ गुणा किया जा सकता है।

उदाहरण:

$(3 + 2)(4 + 1) = 5 \times 5 = 25$

11. लोपनस्थानाभ्याम् (Lopan-Sthāpanābhyām)

अर्थ: हटाने और स्थानापन्न करने द्वारा।

परिभाषा: किसी जटिल समीकरण या गुणा में कुछ पद हटाकर (लोप) या बदलकर (स्थानापन) हल प्राप्त किया जा सकता है।

उदाहरण:

यदि $(x + 3)(x - 3) = x^2 - 9$

मध्य पद हटाकर हल किया गया।

12. विलोचनम् (Vilokanam)

अर्थ: निरीक्षण या देखकर ज्ञात करना।

परिभाषा: कुछ गणनाएँ केवल निरीक्षण से जानी जा सकती हैं।

उदाहरण:

संख्या $125 = 5^3$

देखकर ही ज्ञात हो जाता है कि यह घन है।

13. गुणितसमुच्चयः समुच्चयगुणितः
(GUNITA SAMUCCAYAH SAMUCCAYA GUNITAH)

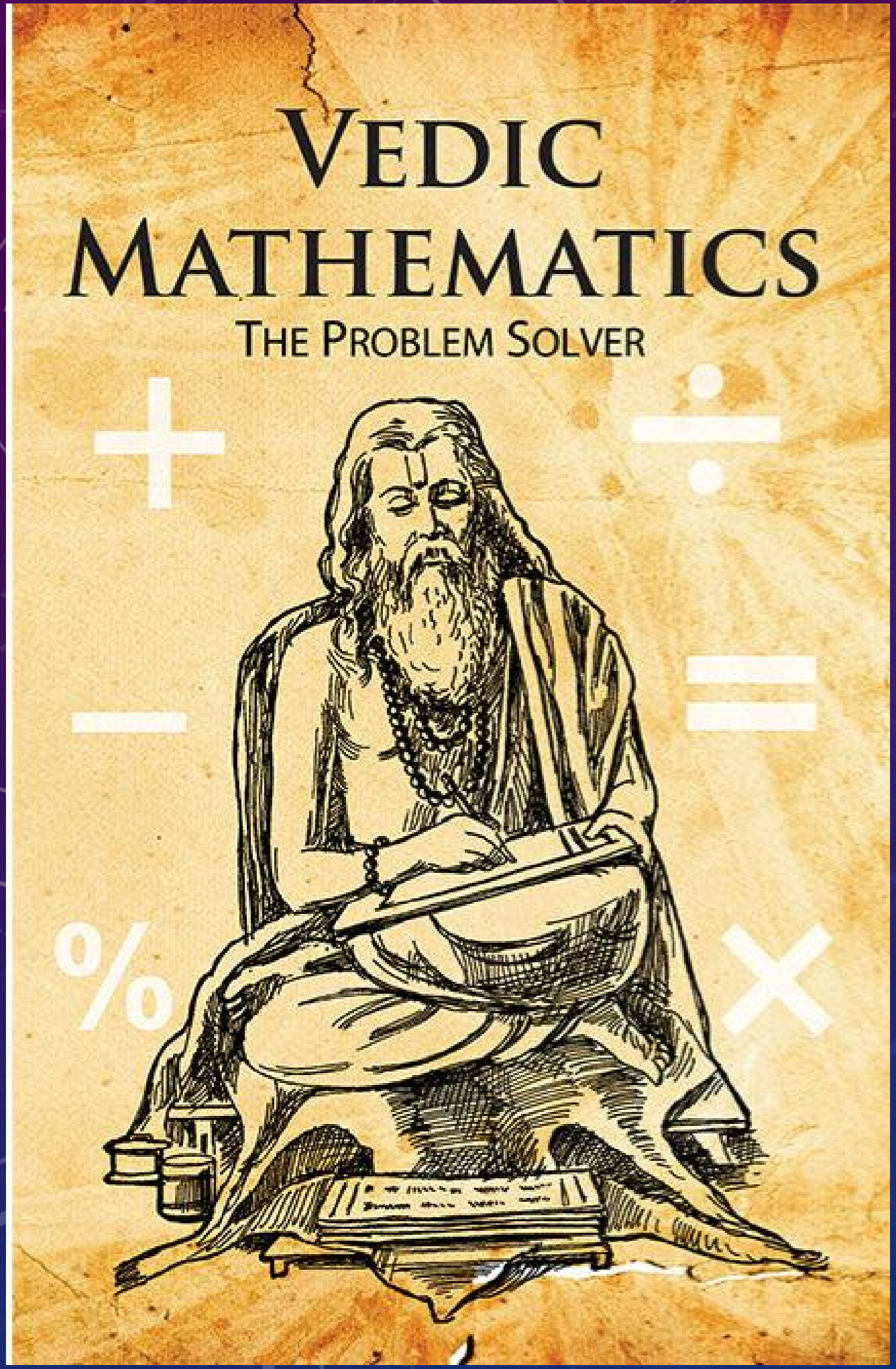
अर्थः गुणित और योग का संबंध।

परिभाषाः किसी गणना में यदि गुणित (PRODUCT) और योग (SUM) दोनों समान अनुपात में हों, तो परिणाम समान रहता है।

उदाहरणः

(2×3) और (1×6) — दोनों का गुणनफल 6 → परिणाम समान।

THANK YOU



A PRESENTATION ON

. **VEDIC MATHEMATICS**

BY – PRATHAM SEN

INTRODUCTION

Vedic Mathematics is an ancient Indian mathematical system derived from the Vedas and Upanishads. It’s a simple, logical, and effective system that helps solve complex mathematical problems.

ORIGIN OF VEDIC MATHEMATICS

BHARATI KRISHNA TIRTHAJI

- Vedic Mathematics originated in ancient India, with its roots in the Vedas and Upanishads. The fundamental principles of Vedic Mathematics are described in the Rigveda, Yajurveda, and Atharvaveda.

IMPORTANCE OF VEDIC MATHEMATICS

- *Simple and Logical*: Vedic Mathematics is simple and logical, making it easy to understand and apply.

- *Effective*: Vedic Mathematics is effective in solving complex mathematical problems quickly and accurately.

- *Mental Calculation*: Vedic Mathematics promotes mental calculation, enhancing cognitive skills and brain activity.

- *Mathematical Skills*: Vedic Mathematics develops mathematical skills, useful in various aspects of life.

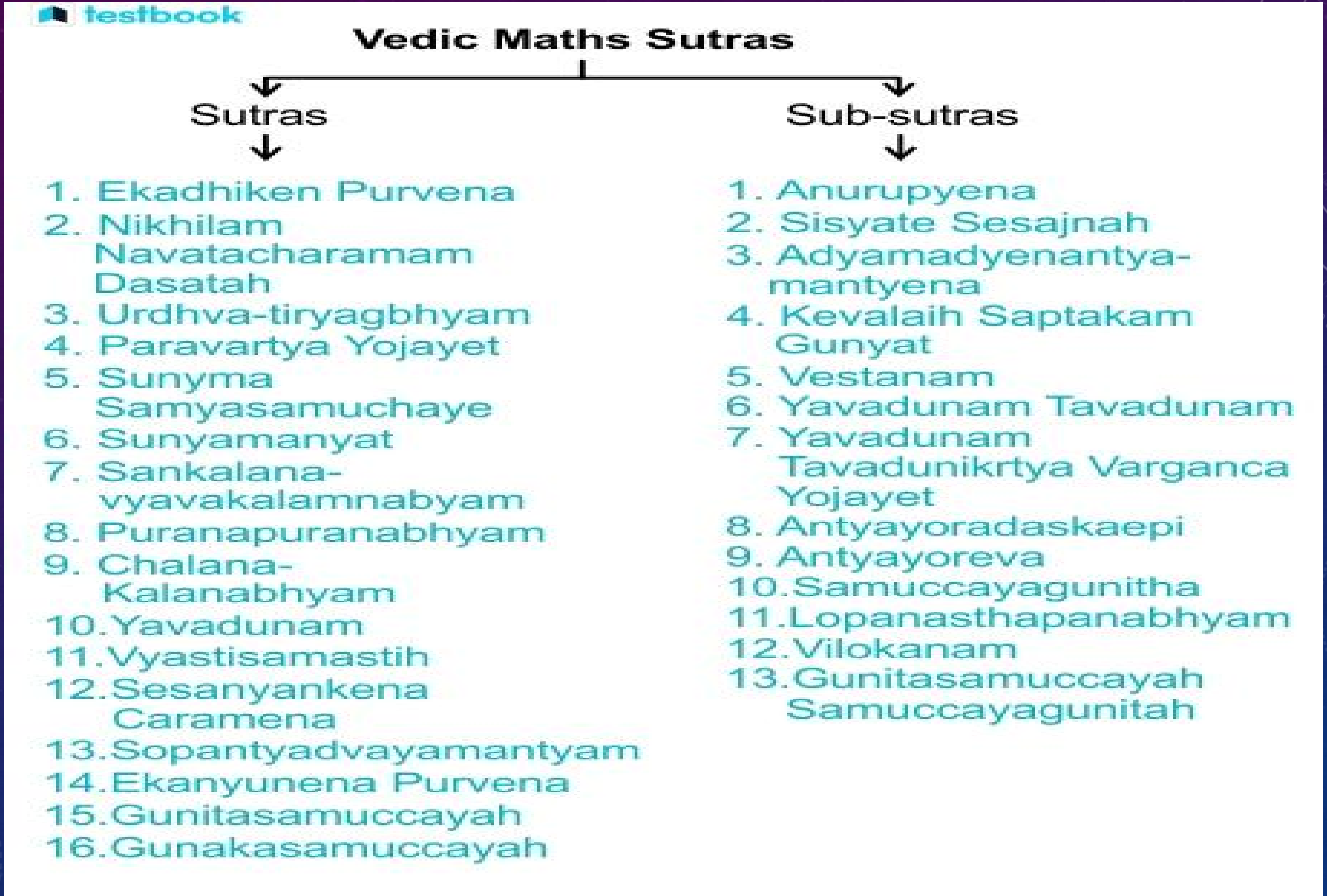
THE KEY PRINCIPLES OF VEDIC MATHEMATICS INCLUDE:

Sutras: Vedic Mathematics uses sutras, or formulas, to solve mathematical problems.

- *sub-Sutras*: sub-Sutras are sub-formulas that simplify the application of sutras.

- *Mental Calculation*: Vedic Mathematics emphasizes mental calculation for quick and accurate problem-solving.

LIST OF SUTRAS AND SUB SUTRAS

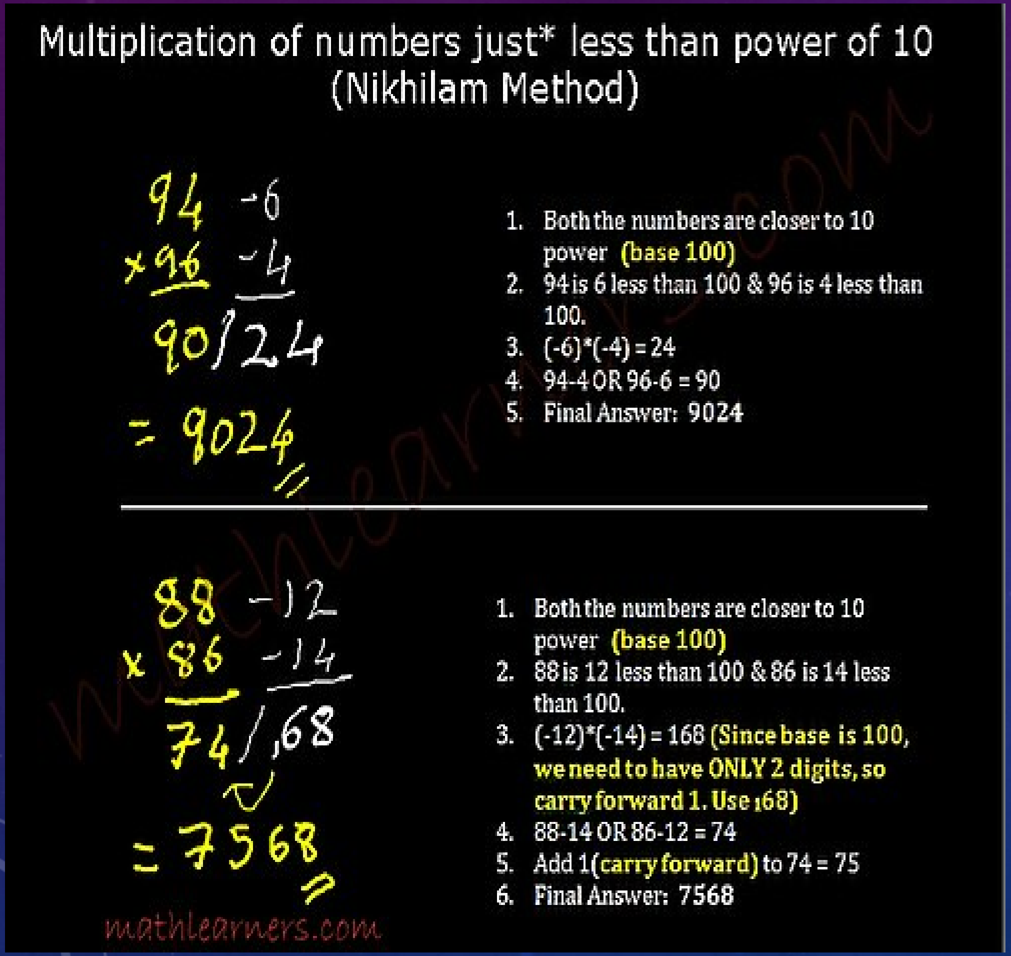


THE 16 SUTRAS OF VEDIC MATHEMATICS

1.EKADHIKENA PURVENA

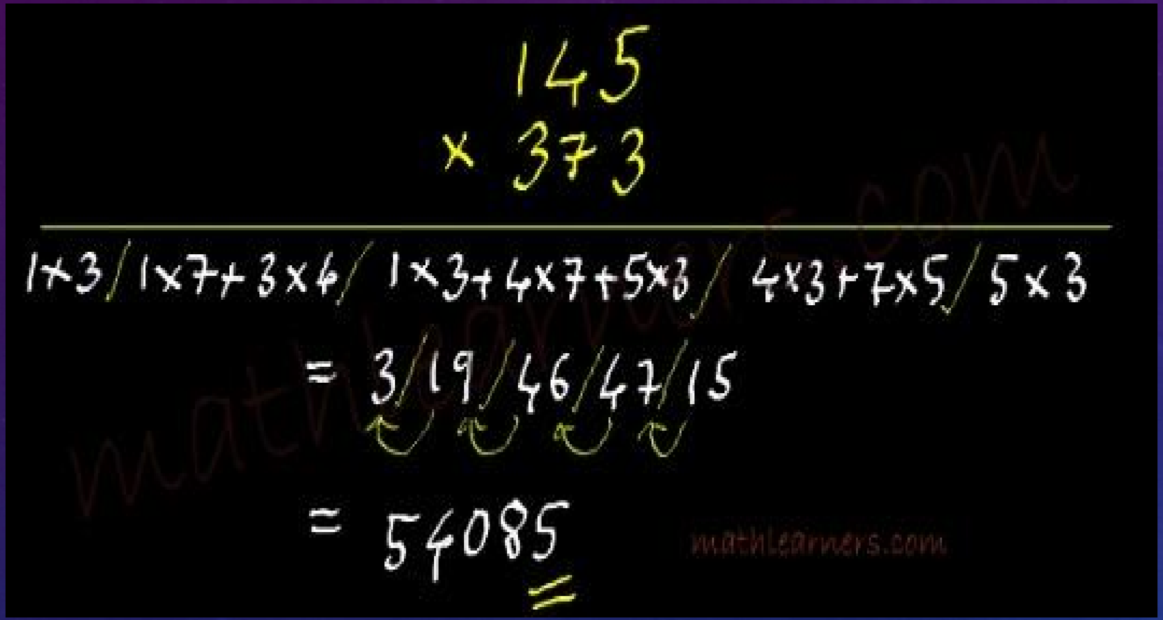
- Ekadhikena Purvena (By one more than the previous one): This one’s a gem for squaring numbers ending in 5. Say you want to square 25. Look at the previous digit (2), multiply it by one more than itself (3), and you get 6. Slap 25 on the end, and bam! 625. That’s 25 squared, quick and easy.

2.NIKHILAM NAVATASHCARAMAM DASHATAH



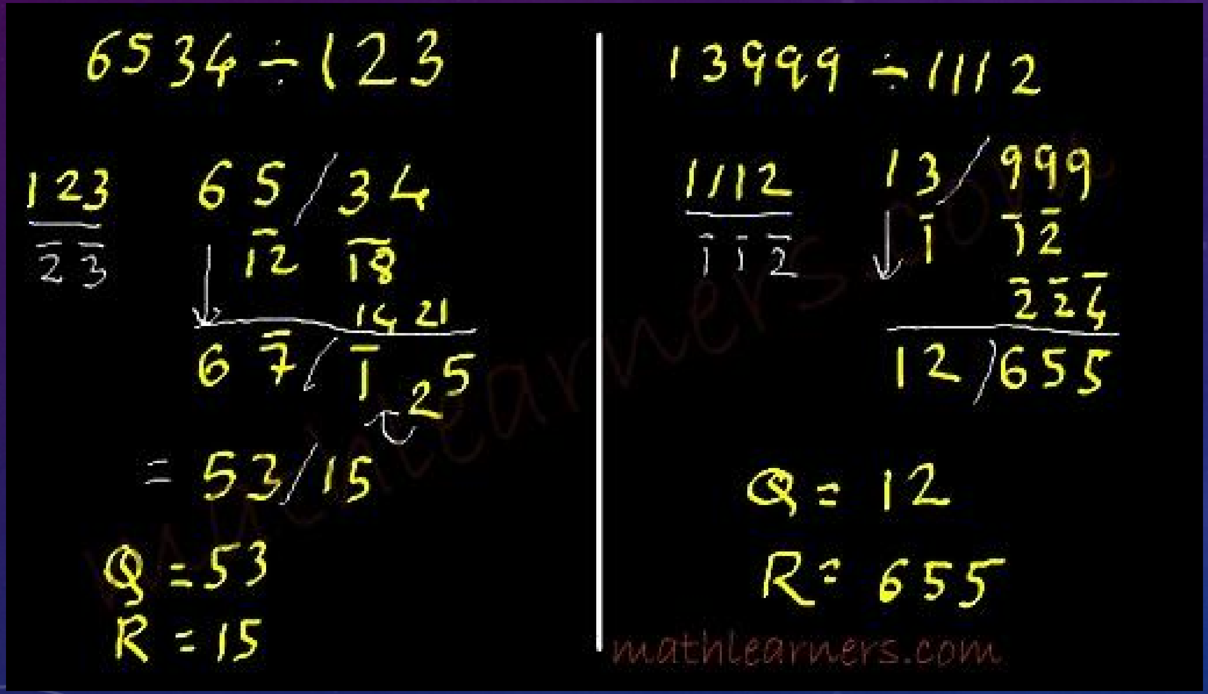
- Nikhilam Navatashcaramam Dashatah (All from 9 and the last from 10): Use this when you're multiplying numbers close to 10, 100, or 1000. It's all about working with the difference, making big number multiplication a breeze.

3.URDHVA-TIRYAKBYHAM



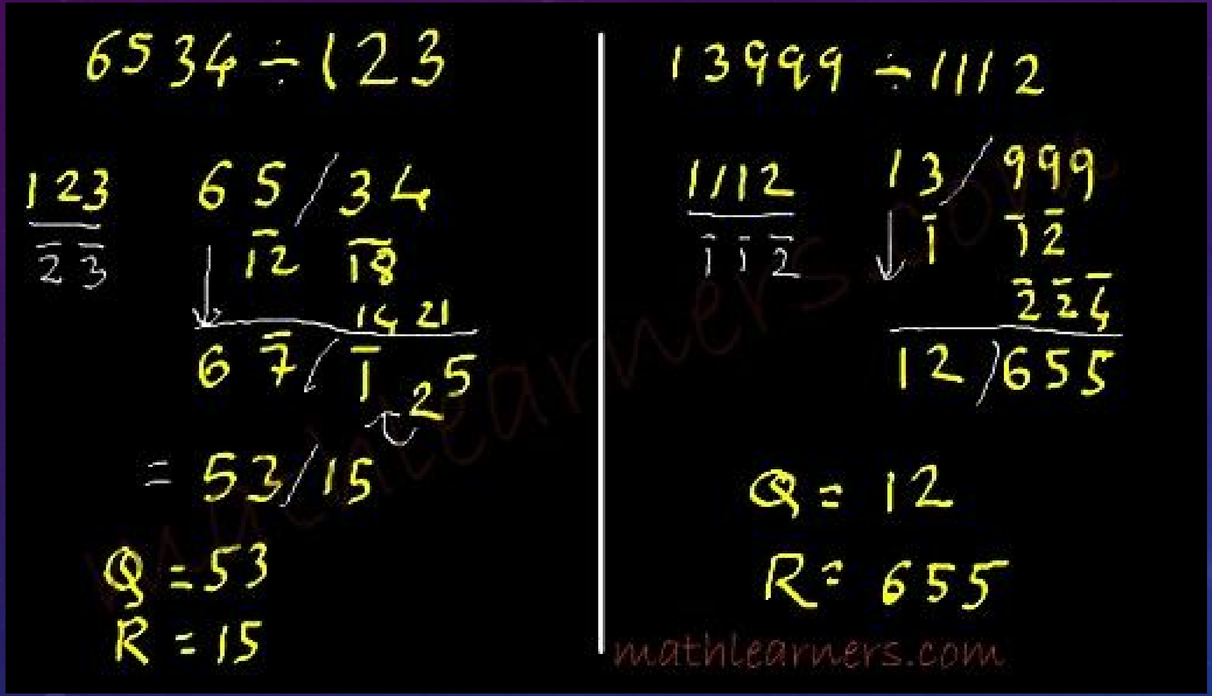
- Urdhva-Tiryakbyham (Vertically and crosswise): This is your go-to for general multiplication. It involves cross-multiplication and vertical addition. Great for big numbers and even algebra.

4.PARAAVARTYA YOJAYET



- Paraavartya Yojayet (Transpose and adjust): This one's a lifesaver for division problems and quadratic equations. It gives you a whole new way to approach these tricky areas.

5.SHUNYAM SAAMYASAMUCCAYE



- Shunyam Saamyasamuccaye (When the sum is the same, that sum is zero): Helpful for certain equations where everything adds up to zero. It’s like finding balance in your calculations

6.ANURUPYE SHUNYAMANYAT

(Anurupye) Shunyamanyat or

"If one is in ratio, the other one is zero"

This sutra is often used to solve simultaneous simple equations which may involve big numbers. But these equations in special cases can be visually solved because of a certain ratio between the coefficients. Consider the following example:

```
6x  +  7y = 8
19x + 14y = 16
Here the ratio of coefficients of y is same as that of the constant
terms.
Therefore, the "other" is zero, i.e., x = 0. Hence the solution of the
equations is x = 0 and y = 8/7.
```

This sutra is easily applicable to more general cases with any number of variables. For instance

```
ax + by + cz = a
bx + cy + az = b
cx + ay + bz = c
 which yields x = 1, y = 0, z = 0.
```

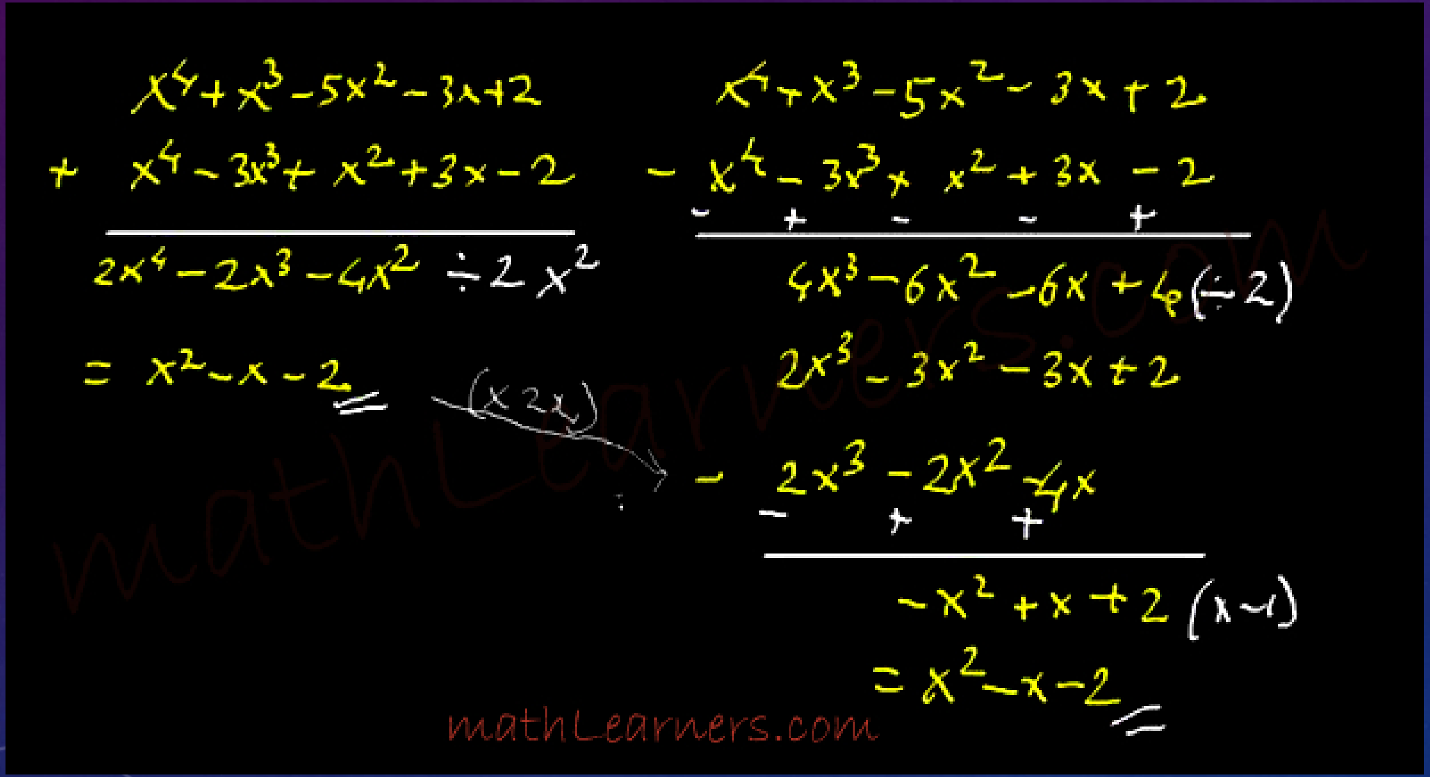
A corollary (upsutra) of this sutra says **Sankalana-Vyavakalanaabhyam** or *By addition and by subtraction*. It is applicable in case of simultaneous linear equations where the x- and y-coefficients are interchanged. For instance:

```
45x - 23y = 113
23x - 45y = 91
 By addition: 68x - 68 y = 204 => 68(x-y) = 204 => x - y = 3
```

By subtraction: 22x + 22y = 22 => 22(x+y) = 22 => x + y = 1

- Anurupye Shunyamanyat (If one is in ratio, the other is zero): This one’s all about proportions and equations. It’s particularly useful in scenarios where one quantity is proportionally related to another.

7.SANKALANA-VYAVAKALANABHYAM



Sankalana-vyavakalanabhyam (By addition and by subtraction): Use this for solving simultaneous equations by strategically adding or subtracting them.

8.PURANAPURANABHYAM

8. Puranapuranabhyam: By the completion or non-completion.

1. Solve quadratic, biquadratic

Eg1: Qudratic equation: $x^2 + 2x - 8 = 0$

$$x^2 + 2x.1 + 1^2 - 1 - 8 = 0$$

$$(x+1)^2 - 9 = 0$$

$$(x+1)^2 = 9$$

$$(x+1)^2 = 3^2$$

$$x+1 = -3 \Rightarrow x = -4$$

x $$x + 1 = 3 \Rightarrow x = 2$$

- Puranapuranabhyam (By the completion or non-completion): This one's for multiplication and division. It involves breaking down numbers into parts for easier calculation.

9.CHALANA-KALANABYHAM

9. Chalana-Kalanabyham:

Differences and Similarities.

Solve $x^2 - 2x - 4 = 0$

$D = b^2 - 4ac$

$= (-2)^2 - 4.1.(-4) = 20$

Differentiate => $2x-2 = \pm\sqrt{20}$

$2x-2 = +\sqrt{20}$, $2x-2 = -\sqrt{20}$

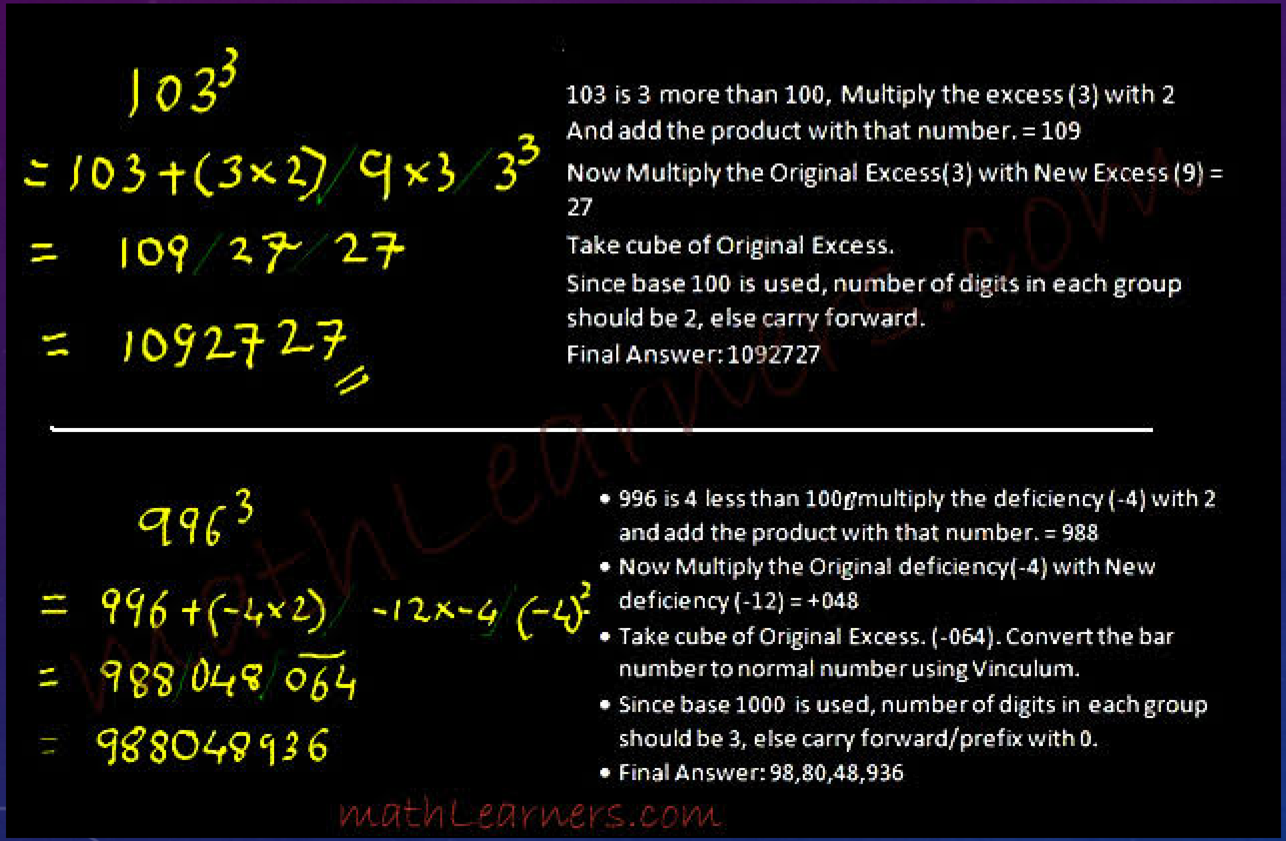
$2(x-1) = +2\sqrt{5}$, $2(x-1) = -2\sqrt{5}$

$(x-1) = +\sqrt{5}$, $(x-1) = -\sqrt{5}$

$\mathbf{x = 1 + \sqrt{5}}$, $\mathbf{x = 1 - \sqrt{5}}$

- Chalana-Kalanabyham (Differences and Similarities): This one's for the big leagues - differential calculus. It's about finding derivatives.

10.YAAVADUNAM



- Yaavadunam (Whatever the extent of its deficiency): Great for quadratic equations. It’s all about working with what’s missing or extra in a problem.

11.VYASHTISAMASTHI

1) $x^3 + 9x^2 + 24x + 16 = 0$ i.e. $x^3 + 9x^2 = -24x - 16$

We know that $(x+3)^3 = x^3+9x^2+27x+27 = 3x + 11$ (Substituting above step).

i.e. $(x+3)^3 = 3(x+3) + 2$ ... (write $3x+11$ in terms of LHS so that we substitute a term by a single variable).
Put $y = x+3$
So, $y^3 = 3y + 2$
i.e. $y^3 - 3y - 2 = 0$
Solving using the methods discussed (coeff of odd power = coeff of even power) before.
We get $(y+1)^2 (y-2) = 0$

So, $y = -1 , 2$

Hence**x = −4,−1**

- Vyashtisamasthi (Part and Whole): Use this for equations and factorization. It leverages the relationship between parts and the whole to simplify complex problems.

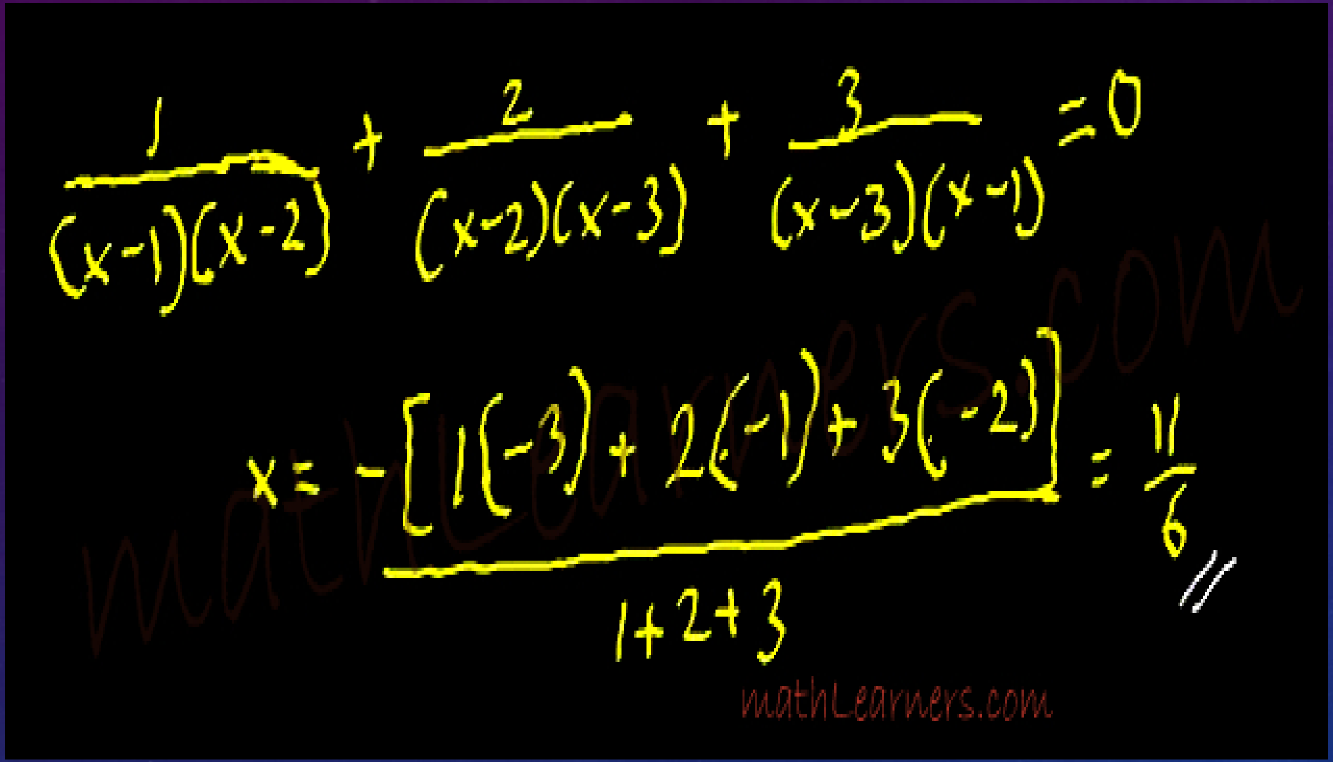
12.SHESANYANKENA CHARAMENA

Example: 1/7

- As seen earlier successive remainders are 1, 3, 2, 6, 4 and 5.
- We will write them as 3, 2, 6, 4, 5 and 1.
- Multiply them with last digit of divisor (7): 21, 14, 42, 28, 35 and 7
- Now take their last digits and that's the final answer: 0.142857. (another interesting concept).

Shesanyankena Charamena (The remainders by the last digit): This one's for finding remainders and checking divisibility. Quick and dirty tricks for common math operations.

13.SOPAANTYADVAYAMANTYAM



- Sopaantyadvayamantyam (The ultimate and twice the penultimate): Another quadratic equation solver. It gives you a unique angle on these problems.

14.EKANYUNENA PURVENA

2 x 9 =	1	8
3 x 9 =	2	7
4 x 9 =	3	6
5 x 9 =	4	5
6 x 9 =	5	4
7 x 9 =	6	3
8 x 9 =	7	2
9 x 9 =	8	1
10 x 9 =	9	0

11 x 99 =	10	89
12 x 99 =	11	88
13 x 99 =	12	87
14 x 99 =	13	86
15 x 99 =	14	85
16 x 99 =	15	84
17 x 99 =	16	83
18 x 99 =	17	82
19 x 99 =	18	81
20 x 99 =	19	80

- Ekanyunena Purvena (By one less than the previous one): Helpful in factorization and solving equations. It offers another perspective on number relationships.

15.GUNITASAMUCHYAH

Examples:

$2x^2 + 5x - 3$

1. **Anurupyena:** Split middle terms coeff(5) in 2 parts such that coeff of x^2 term to 1st coeff of x term = Ratio of 2nd coeff of x term to constant term.Hence split it in 6 and -1 (2/6 = -1/-3) => $2x^2 + 6x - x - 3$So **1st factor: x+3** (2:6)
2. **Adyamadyenantyamantya:** Divide the first term's coeff (2) of eq by 1st term of factor(1) and divide last term of eq (-3) by 2st term of factor (3)So **2nd factor: 2x-1**

- Gunitasamuchyah (The product of the sum is equal to the sum of the product): Use this for multiplication and proving algebraic identities. It reveals interesting properties of sums and products.

16.GUNAKASAMUCHYAH

15. Gunakasamuccayah:

The factors of the sum are the sam…
as the sum of the factors.

$x^2+5x+4 = (x+4)(x+1)$

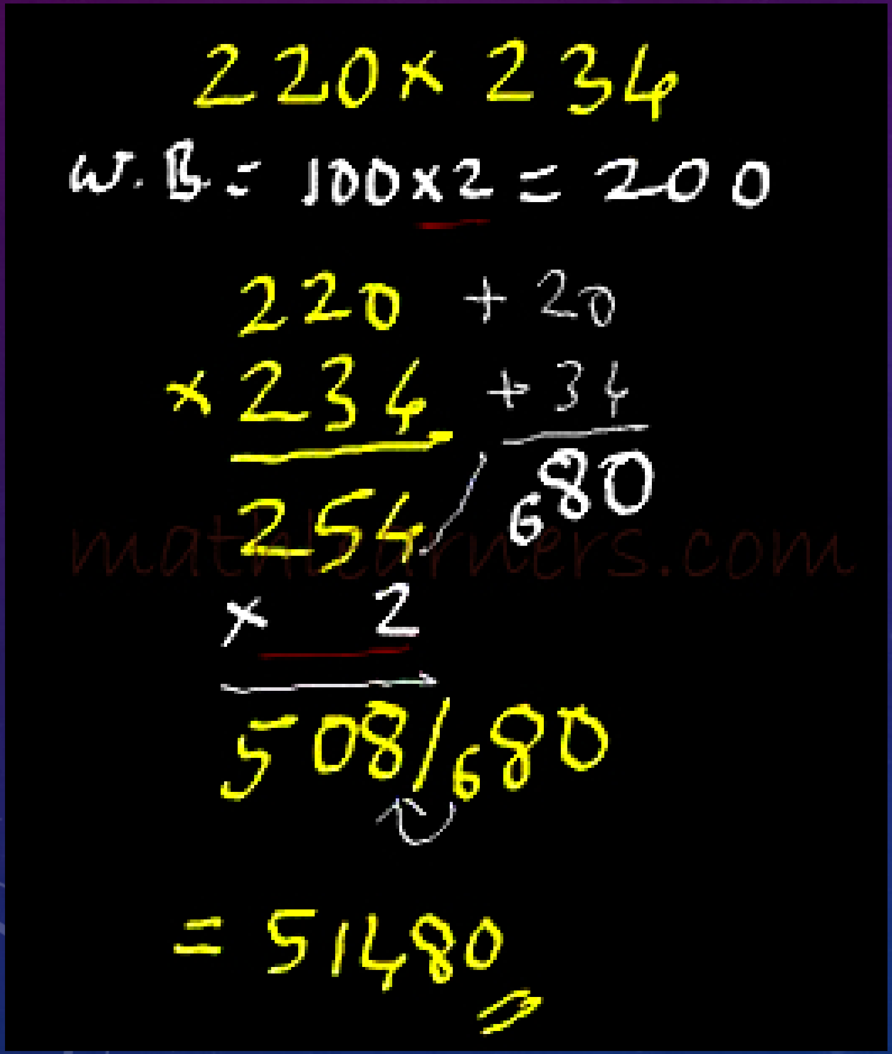
$2x+5 = (x+4)+(x+1)$

The factors of the sum are the same as the sum of the factors.

- Gunakasamuchyah (The factors of the sum is equal to the sum of the factors): Great for factorization and solving equations. It gives you insights into factors and sums.

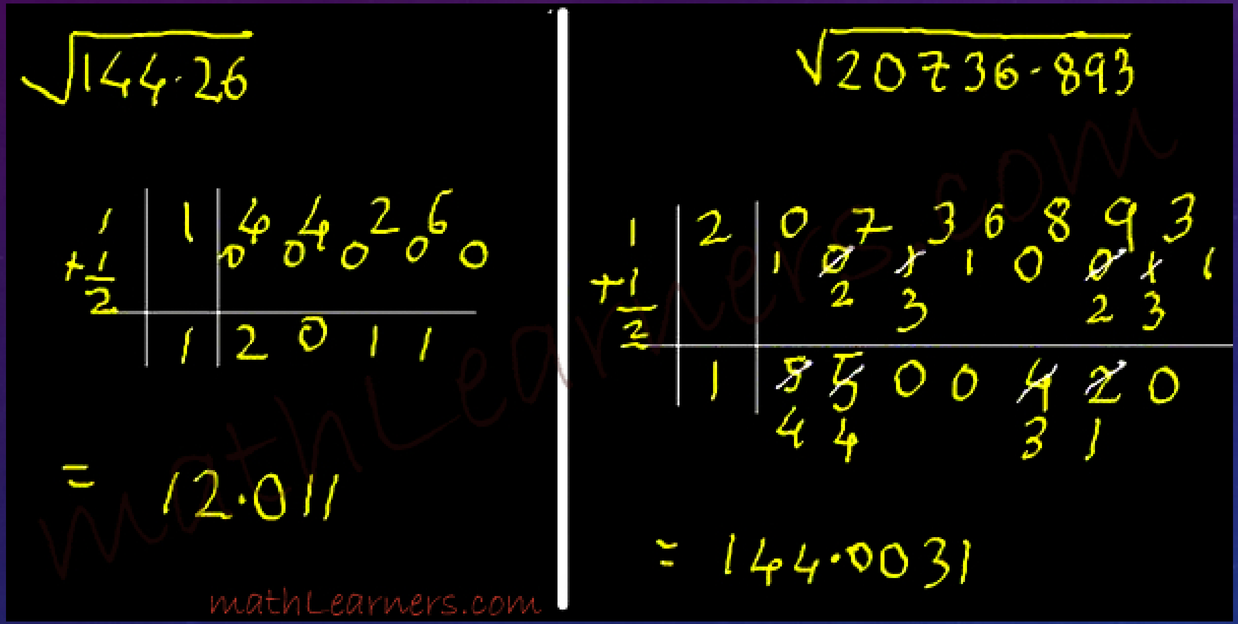
The 13 Sub-Sutras of Vedic Mathematics

1.ANURUPYENA



- Anurupyena (Proportionality): This one's gold for solving proportion problems and ratios. It's like having a built-in calculator for tricky percentage questions.

2.SHESHAANYANKENA CHARAMENA



- Sheshaanyankena Charamena (The remainders by the last digit): Want to find remainders quickly? This is your go-to. It's all about the relationship between a number's last digit and its remainder.

3.AADYAMAADHYENA ANTYAMAADHYENA

Examples:

$2x^2 + 5x - 3$

1. **Anurupyena:** Split middle terms coeff(5) in 2 parts such that coeff of x^2 term to 1st coeff of x term = Ratio of 2nd coeff of x term to constant term.Hence split it in 6 and -1 (2/6 = -1/-3) => $2x^2 + 6x - x - 3$So **1st factor: x+3** (2:6)
2. **Adyamadyenantyamantya:** Divide the first term's coeff (2) of eq by 1st term of factor(1) and divide last term of eq (-3) by 2st term of factor (3)So **2nd factor: 2x-1**

- Aadyamaadhyena Antyamaadhyena (The first by the first and the last by the last): Use this when you're multiplying numbers with the same number of digits. This sub-sutra offers a quick method for certain types of multiplication.

4.KEVALAIH SAPTAKAM GUNYAT

Usage:

On the basis of 1/7, without any multiplication we can calculate 2/7, 3/7, 4/7, 5/7 and 6/7. For that 1/7=0.142857 is to be remembered. But since remembering 0. 142857 is difficult we remember Kevala(143). This is only use of this sutra (for remembrance).

1/7 = 0.142857

- Kevalaih Saptakam Gunyat (When multiplied by 7): Got to multiply by 7? This sub-sutra’s got your back. It’s a niche skill, but it’ll come in handy more often than you’d think.

5.VESTANAM

Examples:

Lets check whether 21 is divisible by 7.
For 7, Ekadhika(positive osculator) is 5
So as per the mentioned process, multiply 5 with 1 and add 2 to the product.

- 21; 1×5+2 = 7 (Divisible by 7)
- 91; 1×5+9 = 14 (Divisible by 7). Can be continued further as
  14; 4×5 + 1 = 21; and
  21;1×5+2 = 7
- 112; 2×5+11= 21. (seen earlier)
- 2107; 7×5 + 210 = 245
  245; 5×5+24= 49 (Divisible by 7 or continue further).

- Vestanam (By Osculation): This one’s for squaring numbers near multiples of 10. It offers a quick method for mental calculation of squares.

6.YAAVATDUNAM TAAVATDUNAM

Example: Find the square of 97

1. **Choose a base:** The closest power of 10 to 97 is 100.
2. **Find the deficiency:** The number is 97. The deficiency is $100 - 97 = 3$.
3. **Find the deficiency squared:** $3^2 = 9$. Since the base (100) has two zeros, write the deficiency squared with two digits: 09.
4. **Find the first part of the answer:** Subtract the deficiency from the original number: $97 - 3 = 94$.
5. **Combine the results:** Place the first part (94) to the left of the second part (09). The answer is 9409.

- Yaavatdunam Taavatdunam (By deficiency or excess): Use this when you’re multiplying numbers near 10 or 100. It’s all about working with the difference, making big multiplications a breeze.

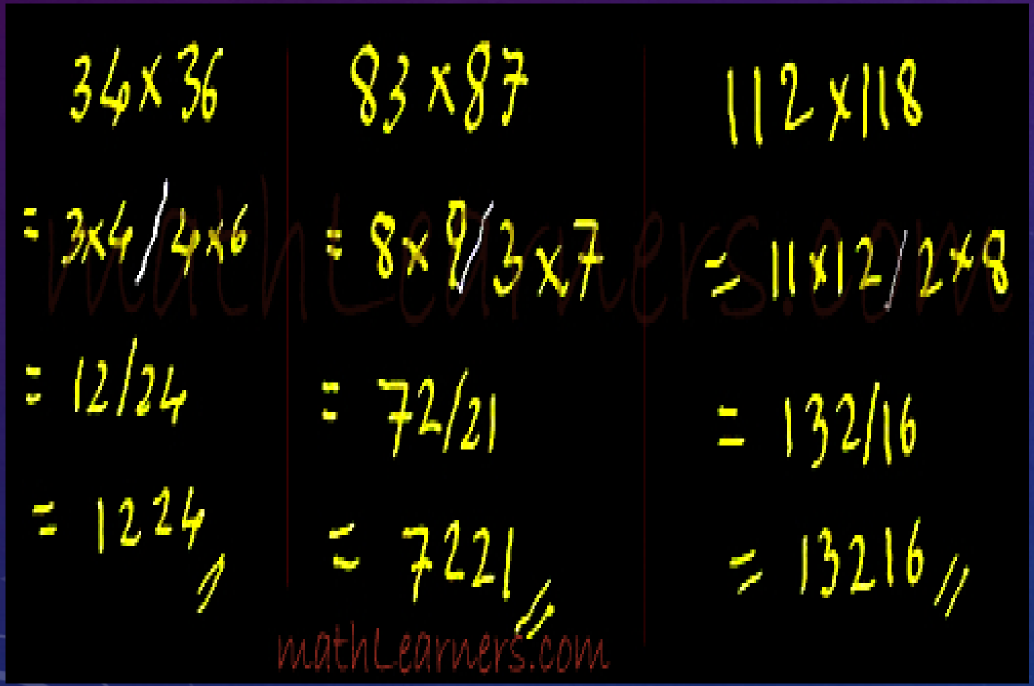
7.YAAVATDUNAM TAAVATDUNIKRITYA VARGACHA YOJAYET

How to apply the example (squaring 13)

1. **Identify the base**: Choose a power of 10 close to the number. For 13, the nearest base is 10.
2. **Find the deficiency**: Determine the difference between the number and the base. For 13, this is $13 - 10 = 3$.
3. **Calculate the first part**: Add the deficiency to the original number. $13 + 3 = 16$.
4. **Calculate the second part**: Square the deficiency. $3^2 = 9$.
5. **Combine the results**: Place the second part next to the first part. The result is 169.

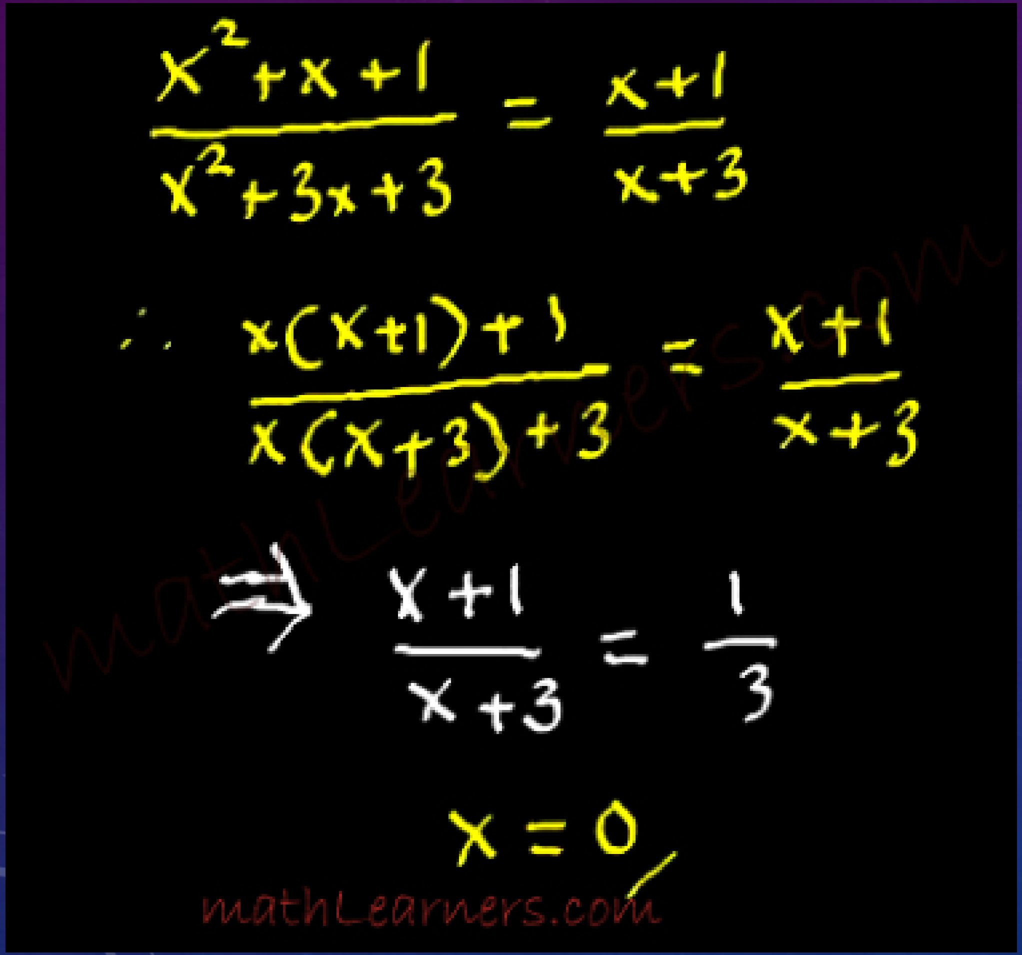
- Yaavatdunam Taavatdunikritya Vargacha Yojayet (Whatever the deficiency, multiply that by itself and add): Another gem for squaring numbers near multiples of 10. It’s like a mental shortcut for your mental shortcuts.

8.ANTYAYOREVA



- Antyayordasake’pi (Last totaling 10): This one’s for when you’re multiplying and the last digits add up to 10. It’s a specific case, but when it applies, it’s lightning fast.

9.ANTYAYOREVA



Antyayoreva (Only the last terms): Use this when you're multiplying numbers with the same number of digits. It's about focusing on the last terms to simplify the process.

10.SAMUCCHAYAGUNITAH

Example:

$4x^2 + 12x + 5 = (2x+1)(2x+5)$

Sum of the coefficients in the product: 4 + 12 + 5 =**21**

Product of the sum of the coefficients of the factors: (2+1)(2+5) = **21**

Samucchayagunitah (The sum of the coefficients in the product): This one’s for the algebra whizzes. It helps you figure out coefficients in multiplication without breaking a sweat.

11.LOPANASTHAPANABHYAM

Examples:

1. Factorize $2x^2 + 6y^2 + 3z^2 + 7xy + 11yz + 7zx$

We have 3 variables x,y,z.

Applying Lopanasthapana, remove any of the variable. Lets Eliminate z by putting z=0.
Hence the given expression

$E = 2x^2 + 6y^2 + 7xy$

= **(x+2y) (2x+3y)** … (**Combination of Anurupyena & Adyamadyenantyamantya**).
Similarly, if y=0, then
$E = 2x^2 + 3z^2 + 7zx$

= **(x+3z) (2x+z)**

As x and 2x are present separately and uniquely.Hence we cay map to get Factors.
E = **(x+2y+3x) (2x+3y+z)**

Lopanasthapanabhyam (By alternate elimination and retention): Got simultaneous equations? This sub-sutra will help you solve them by systematically eliminating and keeping terms.

12.VILOKANAM

$$x + \frac{1}{x} = \frac{10}{3}$$

$$\frac{x^2+1}{x} = \frac{10}{3}$$

$$3x^2 + 3 = 10x$$

$$3x^2 - 10x + 3 = 0$$

$$3x^2 - 9x - x + 3 = 0$$

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

$$(x-3)(3x-1) = 0$$

Implies $x - 3 = 0$ or $3x - 1 = 0$

i.e. $x = 3$ or $3x = 1$

i.e. $x = 3$ or $x = \frac{1}{3}$

But by VILOKANAM i.e. observation

$x + \frac{1}{x} = \frac{10}{3}$ can be viewed as

$x + \frac{1}{x} = 3 + \frac{1}{3}$ giving $x = 3$ or $x = \frac{1}{3}$

By observation - often mental calculator can decide method for solving problem instantly.

Vilokanam (By mere observation): This sub-sutra encourages you to simplify and observe carefully, often leading to quicker solutions.

13.GUNITASAMUCHYAH SAMUCHAYAGUNITAH

Example:

$4x^2 + 12x + 5 = (2x+1)(2x+5)$

Sum of the coefficients in the product: 4 + 12 + 5 =**21**

Product of the sum of the coefficients of the factors: (2+1)(2+5) = **21**

Gunitasamuchyah Samuchayagunitah (The product of the sum is equal to the sum of the product): Use this for certain types of multiplication, especially with algebraic expressions.

CONCLUSION

Vedic Mathematics is an ancient Indian mathematical system that's simple, logical, and effective. It helps solve complex mathematical problems and promotes mental calculation, developing mathematical skills useful in various aspects of life.

Late. Raja Virendra Bahadur Singh College Saraipali

Presentation on Vedic Maths

-By Dev Aditya

Sutras & Sub-sutras of Vedic Maths

Sutras

1.Ekadhiken Purvena
2.Nikhilam Navatacharamam Dasatah
3.Urdhva-tiryagbhyam
4.Paravartya Yojayet
5. Sunyma Samyasamuchaye
6. Sunyamanyat
7.Sankalana-vyavakalamnabyam
8. Puranapuranabhyam
9.Chalana-Kalanabhyam
10.Yavadunam
11.Vyastisamastih
12.Sesanyankena Caramena
13.Sopantyadvayamantyam
14.Ekanyunena Purvena
15.Gunitasamuccayah
16.Gunakasamuccayah

SUB-SUTRAS

1.Anurupyena
2. Sisyate Sesajnah
3.Adyamadyenantya-mantyena
4.Kevalaih Saptakam Gunyat
5.Vestanam
6. Yavadunam Tavadunam
7. Yavadunam Tavadunikrtya Varganca Yojayet
8.Antyayoradaskaepi
9. Antyayoreva
10.Samuccayagunitha
11.Lopanasthapanabhyam
12.Vilokanam
13.Gunitasamuccayah Samuccayagunitah

SUTRAS

Ekadhikena Purvena-

A Vedic Mathematics technique meaning “by one more than the previous, " is used for various calculations, such as finding the square of numbers ending in 5 and pertorming special divisions.
For squares ending in 5, you take the digits to the lett of the 5, add one to that number, and multiply it by the original number. The result is then followed by 25.

2x(2+1)
2×3
25
= 625

Nikhilam Navatashcaramam Dashatah-

Principle meaning "all from 9 and the last from 1o"'. Its used to simplify calculations, especially for multiplying numbers near powers of 10.
The method involves finding the “deviation" (difference) of each number from the chosen base (e.g., 100), then using a specific combination of subtraction and mutiplication of these deviations to find the final product.It can also be applied to subtraction from numbers like 1000 or 10000.

7X9

Urdhva Tiryagbhyam-

Principle meaning "vertically and crosswise' ana serves as a general formula for multiplying numbers of any size.
The process involves performing vertical multiplications for the units place, then diagonal multiplications and additions for the next place, and continuing this pattern of vertical and crosswise operations to derive the product, carrying over digits as needed.

Urdhva ·Tiryagbhyam
Ex : Multiply 32 by 24 i.e, 32 X 24
1.2×4=8
2.(3x4) + (2x2)
12 +4=16
68
3.3x2=6
=>6+1=7
6

Paravartya Yojayet -

Means “transfer and apply", This formula is especially used for division when the denominator is greater than a power of 10.

6534-1231399941112
2
23
65/341/12
iii
1.3999
3う
1421
677行
=53/15
9:53
R:15
227
121655
S:12
R:655

Shunyam Saamyasamuccaye-

Means “When the sum is equal, that sum is zero.
For example, to solve 9(x+3) =4(x+3), you can equate the common term (x+3) to zero to find x = -3.

SunyamanyaT -

Translates to "if one is in ratio, the other one is zero.
It is used to solve simultaneous
linear equations where the ratio of
the coefficients of one variable is
the same as the ratio of the
independent terms, When this
condition is met, the other variable is equal to zero, and you can then solve for the remaining variable
using either of the original
auatione

1. Identify the ratio: Look for a special relationship between the equations. For example, in the equations 3x + 7y = 2 and 4x +2ly=6, the ratio of the y-coefficients(7 :21)is 1 :3, which is the same as the ratio of the independent terms (2 :6)
2. Apply the rule: According to the sutra, since the y-coefficients are in ratio, the other variable (x) must be zero
3. Solve for the remaining variable: Substitute x = Ointo either equation to find the value of y. For example, using 3x + 7y = 2, you get 7y = 2, which means y= 217.0

Sankalana Vyavakalanabhyam-

A Vedic mathematics technique that means "by addilion and by subtraction.Consider the equations: 45x - 23y = 113 and 23x-45y =91.
Add the equations:
(x-y=3)
Subtract the second equation trom the first:
equation trom the first
(x+y=1)
Adding these gives (2x=4), so(x=2). Substituting x=2 into I(xty=1 gives (2+y=1, 50(y=.1.

Puranapuranabhyam-

Sutra from Vedic Mathematics that means “By completion or non-completion.
It is a technique used to solve equations, particularly quadratic, cubic, and higher-degree equations, by manipulating them to form pertect squares or cubes, or by using factorization. It also has applications in arithmetic, such as quick addition using complements.
8. Puranapuranabhyam: By the completion or non-completion.
1.Solve auadratic. biauadretic
Egl:Qudratic cquation: X+2x-8=0
x*+2x.1+12.1-8=0
(x+1)2-9=0
(x+112=9
(x+1)2=32
x+1 =-3=>x=.4
x+1 =3=>x=2

Chalana Kalanabhyam-

Sanskrit name for the ninth sutra in Vedic Mathematics, which means "by movement and by position" or “differences and similarities.
It is a formula primarily used for simplifying algebraic equations, especially quadratic and cubic ones, and also has applications in calculus. The sutra simplifies calculations by focusing on the incremental differences and
ratios between terms.9. Chalana-Kalanabyham:
Differences and Similarities.
Solve x2.2x-4=(
D=b?-4ac
=(-2P.4.1.(4-4) =20
Differentiate =>2x-2=±V20
2x-2=+V20.2x-2=-/20
2(x-1)=+2V5.2(x-1)=-2/5
(s-:1)=+N5.(x-1)--/s
x=1+V5,x=1-V5

Yavadunam sutra -

Vedic mathematics technique, often translated as “Whatever the extent of its deficiency/excess, " used to find the square of a number by comparing it to a nearby power of 10, ike 10, 100, or 1000.

Example with 13

Base:10

Deficiency/Excess:

13-10=+3

13-10=+3

First part:

13 +3= 16

13+3=16

Second part:

33=9

9=32

Answer: 169

Vyashtisamanstih-

An eleventh-century Vedic mathematics sutra meaning “Part and Whole, "
used for finding the ratio of a part to a whole and for breaking and combining terms in a problem.
It is applicable in various calculations, such as finding fractions of a mixture
or simplifying equations like ((2+3)(2)) by expanding it as (4+6+9)

Shesanyankena Charamena

12h sutra of Vedic Mathematics, which means “The remainders by the last digit”.

• Finding remainders: This sutra can be used to find the remainder
when a number is divided by 9. e

• Converting recurring decimals to fractions:lt provides a quick
method for converting repeating decimals to their fractional form.For example, a repeating decimal like 0.147 can be directly converted to the fraction 147
999

• Calculating the decimal value of fractions: It can be used to
determine the decimal value of certain fractions, For example, the
remainders from dividing I by 7 are 3, 2, 6, A, S, I. Multiplying these
by 7 and taking the last digit of the product (e.g., 3 ×7 = 21, last
digit is I)helps to find the decimal value of 17 = 0.142857. 0

Sopantyadvayamantyam-

Vedic mathematics sutra that translates to "the ultimate and twice the penultimate.

Equation:

E+X)(C+)Z+X)(C+)

$$(x+1)(x+4)+(x+2)(x+3)$$

$$(3+x)(2+x)1+(4+x)(1+x)1=(3+x)(1+x)1+(2+x)(1+x)1$$

Solution: $-10/3$

Ekanyunena Purvena-

Vedic mathematics sutra that means “one less than the previous" and is a shortcut for multiplication, especially when one of the numbers is a series of 9s

2.13154×99

£5-66/1-19

53 146

5346

Gunitasamuccayah-

Embodies the principle that “The sum of the product is equal to the product of the sum.

Sutra 16

गिरगतसमुफचय:

English translationis Gunitasamuccayah.

Its meaning is Productof Sum.

Its applicationis for verificationof solution of equations.

$$2+3x+2=0$$

Factors will be $(x+1)$ and $(x+2)$

Substituting $x=1$

$$2+3x+2=1+3+2=6$$

$$\text{Factors}=(x+1)(x+2)=(1+1)(1+2)=2\times3=6$$

Gunakasamuchyah-

The sum of the coefficients in the factors is equal to the sum of the coefficients in the product.

Example 1

(x+ 2) (x + 5)= ×2 + 7x+10

As is seen in the above form,

that

Sc of the product = Product of

the Sc

(1+2) (1+5)=1+7+10

3x6= 1+ 17

18 =18

Sub Sutras

Anurupyena Sutra-

A shortcut method in Vedic mathematics for multiplication that applies
when numbers are not close to a power of 10, but are close to each other or a multiple
of a base number.
6.Anurupyena: Proportionately.
Eg:46X44=Working base: 40
Multiplication base = 10x4=40
Division = 100 /2= 50
46+6
44+4
cross add
50
Product
24 (keep 4 and carry 2)
x4 (mul.base)
200 +carry 2=2024

Sisyate Sesasaminah--

Corollary of the Vedic Mathematics sutra Nikhilam Navatashcaramam Dashatah ("All
from 9 and the last from 10") and means “the remainder remains constant.The Vedic
math formula "Sisyate Sesasamjnah" is used for
multiplication, meaning "the remainder remains constant." A
common example is 104× 101:0
1. Find the difference between each number and the base (100):
104- 100 = 4 and 101- 100=1.
2.Multiply these differences:4×1=04.
3. Add the first difference to the second number, or the second
difference to the first number: 101 + 4 1 10s (or
104+1= 105)

Adyamadyenantya-mantyena-

Vedic mathematics sutra that means "first by the first and last by the last.
For the equation
2x2+5x-3
, if a factor is found to be
Adyamadyenantyamantya to find the second
using another method like gnurupyeng, you can use
(x+3)
factor.
Divide the first term of the equa on by the first term of the
factor:2x7-x=2x.
Divide the last term of the oquation by the last term of the
factor: -3-3=-1
Combine these results to form the second factor: 2x - 1
This process is demonstrated with the example 287+5x -3.First, the middle term is split into 6x - x to get the first factor (x + 3). Then, the
Adyamadyenantyamantya sutra is opplied: @2x2÷×=2x
3÷3=-1
cond factoris 2x - 1

Kevalaih Saptakam Gunyat-

Vedic mathematics technique, a sub-sutra of the Parayartya Sutra, which means “transpose and adjust".

Vestanam Sutra-

Sub-sutra in Vedic Mathematics that means “by osculation" and is used to simplity divisibility checks, especially for numbers ending in 1, 3, 7, or 9.Positive
Osculator: Used in division and multiplication where the last digit is 1.
Negative Osculator: Used when the last digit of the divisor is not 1, requiring multiplication to make it 1.
• Example: To check if 343 is divisible by 7, you find the negative
osculator by multiplying 7 by 3 to get 21.The negative osculator is 2.Then you use this osculator and the last digit to determine if 343 is divisible by 7. @

Yavadunam Tavadunam Sutra-

10 (like 10, 100, 1000).

Vedic mathematics technique for squaring numbers close to a power of

Example: 98?

1. Deficiency:98 - 100=-2.
2. Square the deficiency:(-27=4.
3. Subtract the deficiency from the number: 98 -2 = 96.
4. Combine: 9604 (using two digits for the deficiency part because the base is 100)

Yavadunam Tavadunikrtya

Vargancha Yojayet.

Is a formula in Vedic mathematics that is used to find the squares of numbers that are close to powers of 10 (10, 100, 1000, etc.). This means, subtract its deficiency from the number and write the sguare of that deficiency.

SQUARE OF 8

10 - 8=2, SQUARE OF 21s 4

8-2=6

THus, SQUARE OF 8 = 64

Antyardeshkepi-

A term that refers to the Vedic mathematics method Antyayordasake's pi, also known as Antyardeshkepi, used for multiplication.

If's a technigue where the sum of the unit digits is 10, and the preceding digits are the same, The multiplication is done by multiplying the preceding digits with one more than that digit, and then multiplying the unit digits together.1. ldentty the numbors: Uhe twonunbers where the sum of the las dgis is 10 and the other digts are the same leg. 24×20), 。 2. lut purto thenswern unpy meron.untdgtbycanemor than iteol

· 24x26 menmmunt dgı2

·Multijpy2x(2+1)=2x3=6.0

3. Roht part of theanswer.wumepytheunt ágits togeter

· For 24x 26: The unit digits sre 4 ands

· Multipy4x6=24.

4. Combinethe parts. Comtine theresultstrombodh adons to get the

Antyayoreva-

A Vedic Mathematics sutra meaning "only the last terms" or "only the last digits”.
Multiplication Application (e.g., by 1)
When multiplying anumber by 11, this sutra provides a shortcut:

1. Wite the last digit of the number asis
2. Add the last diglt to the next digilt to its left, and place this sum between them.
3. Continue thls process, addingadjacent digits untl the first dilgit of the original number is reached

Example: To multiply 35 by 11:01. Write the last diait, 5.
2. Add 3+5 =8, andplacelitbelore the 5
3. Wite the first digit, 3, before the 8.
4. The result is 385.

Samuccayagunitah-

Vedic mathematics sub-sutra that means “the product of the sums" or the sum of the products, " used to verify calculations.

· Example: For the multijplication (x + 3)(x + 2), the sum of the coefficients in the factorsis (1 +3)×(1+2)=4×3=12.The product is .xP + 5r + 6, and the sum of its coefficients is 1+5+6=12, which confirms the result

lopanasthapanabhyam-

Vedic mathematics sutra that means “by alternate elimination and retention.
It is used to solve problems by alternately eliminating one variable to solve for the remaining ones, and it can be applied to problems like factorization of quadratic equations, finding the Highest Common Factor (HCF), and
solving simultaneous equations.

• Example t: Find the HCF of x7+ 5x +4andx2+7x+6.
· Method: Subtract the two expressions.•Calculation:
·(22+7x+6)-(82+5x+4)=2x+2
· Result: The HCFis (x + I), whichis a factor of both 2x + 2 and the original polynomials

Examole: Factor the exoressior
38479+29411824702+62?.

- Method: Tomporarly set one varlable to zero to roduce the problem
- Step1:Put z = 0.The expressionbecomes307+7xy+20?
- Step 2: Factor the resultinaauadratic expression, which aives (3x +y)(x+2y).
- Stop 3: Wth y = 0, the original expression become 341182462.hls factors to (3x +22)(× +.32).
- Step 4:With x = 0, the exprossionbecomes 27+7yz+62?This factors to (2y+32)(y+ 2z)

Vilokanam-

Vedic mathematics concept that means “by mere observation" and is used for two main purposes: fast addition (also called spark addition) and finding the square root of pertect squares

Example: Finding the square root of 2116

1. Group the digits: Starting from the right, group the digits Inpairs: 21 16. 0
2. Find the unit digit: Look at the unit digilt of the last group (16), which is 6. The unit dlgit of the square root will be elther 4 or 6, because 43= 16and67 = 36. @
3. Find the tens digit: Look at the frst group (21). Find the largest number whose square is less than or equal to 21. This is 4 (42 = 16). So, the tens digit of the square root is 4.@
4. Determine the possible roots: Based on steps 2 and 3, the possible square roots are 44 or 46. 0
5. Choose the correct root: To declde between 44 and 46, find the square of a number ending in S between them, which is 45. Calculate 457 = 2025. Since the original number, 2116, is greater than 2025, the square root must be the larger of the two options. o
6. Final Answer: The square root of 2116is 46. 0

Gunita samuchaya samuchay gunita-

A Vedic mathematics principle that means “the product of the sums of the coefficients of the factors equals the sum of the coefficients of the product.

- Example:(x+1)(x+2)(x+3)=8*+6x7+11x+6.
- Check:
  - Sum of coefficients of factors;
    (1 + 1)(1 +2)(1+3)=(2)(3)1(4)=24. 0
- Sum of coefficients of the product: 1 +6+11+6=24.0· Since 24 = 24, the result is verified.

Thank you

Late. Raja Virendra Bahadur Singh College Saraipali

Presentation on Vedic Maths

-By Nikhil Tikuliya

Sutras & Sub-sutras of Vedic Maths

Sutras

1.Ekadhiken Purvena
2.Nikhilam Navatacharamam Dasatah
3.Urdhva-tiryagbhyam
4.Paravartya Yojayet
5. Sunyma Samyasamuchaye
6. Sunyamanyat
7.Sankalana-vyavakalamnabyam
8. Puranapuranabhyam
9.Chalana-Kalanabhyam
10.Yavadunam
11.Vyastisamastih
12.Sesanyankena Caramena
13.Sopantyadvayamantyam
14.Ekanyunena Purvena
15.Gunitasamuccayah
16.Gunakasamuccayah

SUB-SUTRAS

1.Anurupyena
2. Sisyate Sesajnah
3.Adyamadyenantya-mantyena
4.Kevalaih Saptakam Gunyat
5.Vestanam
6. Yavadunam Tavadunam
7. Yavadunam Tavadunikrtya Varganca Yojayet
8.Antyayoradaskaepi
9. Antyayoreva
10.Samuccayagunitha
11.Lopanasthapanabhyam
12.Vilokanam
13.Gunitasamuccayah Samuccayagunitah

SUTRAS

Ekadhikena Purvena-

A Vedic Mathematics technique meaning “by one more than the previous, " is used for various calculations, such as finding the square of numbers ending in 5 and pertorming special divisions.

For squares ending in 5, you take the digits to the lett of the 5, add one to that number, and multiply it by the original number. The result is then followed by 25.

2x(2+1)

2×3

25

= 625

Nikhilam Navatashcaramam Dashatah-

Principle meaning "all from 9 and the last from 1o'". Its used to simplify calculations, especially for multiplying numbers near powers of 10.

The method involves finding the “deviation" (difference) of each number from the chosen base (e.g., 100), then using a specific combination of subtraction and mutiplication of these deviations to find the final product.It can also be applied to subtraction from numbers like 1000 or 10000.

7X9

Urdhva Tiryagbhyam-

Principle meaning "vertically and crosswise' ana serves as a general formula for multiplying numbers of any size.

The process involves performing vertical multiplications for the units place, then diagonal multiplications and additions for the next place, and continuing this pattern of vertical and crosswise operations to derive the product, carrying over digits as needed.

Urdhva ·Tiryagbhyam

Ex : Multiply 32 by 24 i.e, 32 X 24

1.2×4=8

2.(3x4) + (2x2)

12 +4=16

68

3.3x2=6

=>6+1=7

6

Paravartya Yojayet -

Means “transfer and apply", This formula is especially used for division when the denominator is greater than a power of 10.

6534-1231399941112
2
23
65/341/12
iii
1.3999
3う
1421
677行
=53/15
9:53
R:15
227
121655
S:12
R:655

Shunyam Saamyasamuccaye-

Means “When the sum is equal, that sum is zero.
For example, to solve 9(x+3) =4(x+3), you can equate the common term (x+3) to zero to find x = -3.

SUNYAMANYAT -

Translates to "if one is in ratio, the other one is zero.
It is used to solve simultaneous
linear equations where the ratio of
the coefficients of one variable is
the same as the ratio of the
independent terms, When this
condition is met, the other variable is equal to zero, and you can then solve for the remaining variable
using either of the original
auatione

1. Identify the ratio: Look for a special relationship between the equations. For example, in the equations 3x + 7y = 2 and 4x +2ly=6, the ratio of the y-coefficients(7 :21)is 1 :3, which is the same as the ratio of the independent terms (2 :6)
2. Apply the rule: According to the sutra, since the y-coefficients are in ratio, the other variable (x) must be zero
3. Solve for the remaining variable: Substitute x = Ointo either equation to find the value of y. For example, using 3x + 7y = 2, you get 7y = 2, which means y= 217.0

Sankalana Vyavakalanabhyam-
A Vedic mathematics technique that means "by addilion and by subtraction.Consider the equations: 45x - 23y = 113 and 23x-45y =91.
Add the equations:
(x-y=3)
Subtract the second equation trom the first:
equation trom the first
(x+y=1)
Adding these gives (2x=4), so(x=2). Substituting x=2 into I(xty=1 gives (2+y=1, 50(y=.1.
Puranapuranabhyam-
Sutra from Vedic Mathematics that means “By completion or non-completion.
It is a technique used to solve equations, particularly quadratic, cubic, and higher-degree equations, by manipulating them to form pertect squares or cubes, or by using factorization. It also has applications in arithmetic, such as quick addition using complements.
8. Puranapuranabhyam: By the completion or non-completion.
1.Solve auadratic. biauadretic
Egl:Qudratic cquation: X+2x-8=0
x*+2x.1+12.1-8=0
(x+1)2-9=0
(x+112=9
(x+1)2=32
x+1 =-3=>x=.4
x+1 =3=>x=2
Chalana Kalanabhyam-
Sanskrit name for the ninth sutra in Vedic Mathematics, which means "by movement and by position" or “differences and similarities.
It is a formula primarily used for simplifying algebraic equations, especially quadratic and cubic ones, and also has applications in calculus. The sutra simplifies calculations by focusing on the incremental differences and
ratios between terms.9. Chalana-Kalanabyham:
Differences and Similarities.
Solve x2.2x-4=(
D=b?-4ac
=(-2P.4.1.(4-4) =20
Differentiate =>2x-2=±V20
2x-2=+V20.2x-2=-/20
2(x-1)=+2V5.2(x-1)=-2/5
(s-:1)=+N5.(x-1)--/s
x=1+V5,x=1-V5

Yavadunam sutra -

Vedic mathematics technique, often translated as “Whatever the extent of its deficiency/excess, " used to find the square of a number by comparing it to a nearby power of 10, ike 10, 100, or 1000.

Example with 13

Base:10

Deficiency/Excess:

13-10=+3

13-10=+3

First part:

13 +3= 16

13+3=16

Second part:

33=9

9=32

Answer: 169

Vyashtisamanstih-

An eleventh-century Vedic mathematics sutra meaning “Part and Whole, "
used for finding the ratio of a part to a whole and for breaking and combining terms in a problem.
It is applicable in various calculations, such as finding fractions of a mixture
or simplifying equations like ((2+3)(2)) by expanding it as (4+6+9)

Shesanyankena Charamena

12h sutra of Vedic Mathematics, which means “The remainders by the last digit”.

- Finding remainders: This sutra can be used to find the remainder when a number is divided by 9. e
- Converting recurring decimals to fractions:lt provides a quick method for converting repeating decimals to their fractional form.For example, a repeating decimal like 0.147 can be directly converted to the fraction 147
999
- Calculating the decimal value of fractions: It can be used to determine the decimal value of certain fractions, For example, the remainders from dividing l by 7 are 3, 2, 6, A, S, I. Multiplying these by 7 and taking the last digit of the product (e.g., 3 ×7 = 21, last digit is l)helps to find the decimal value of 17 = 0.142857. 0

Sopantyadvayamantyam-

Vedic mathematics sutra that translates to "the ultimate and twice the penultimate.

Equation:

E+X)(C+)Z+X)(C+)

(x+1)(x+4)+(x+2)(x+3)

(3+x)(2+x)1+(4+x)(1+x)1=(3+x)(1+x)1+(2+x)(1+x)1

Solution: -10/3

Ekanyunena Purvena-

Vedic mathematics sutra that means "one less than the previous" and is a shortcut for multiplication, especially when one of the numbers is a series of 9s

2.13154×99

£5-66/1-19

53 146

5346

Gunitasamuccayah-

Embodies the principle that "The sum of the product is equal to the product of the sum.

Sutra 16

गिरगतसमुफचय:

English translationis Gunitasamuccayah.

Its meaning is Productof Sum.

Its applicationis for verificationof solution of equations.

2+3x+2=0

Factors will be (x+1) and (x+2)

Substituting x=1

2+3x+2=1+3+2=6

Factors=(x+1)(×+2)=(1+1)(1+2)=2×3=6

Gunakasamuchyah-

The sum of the coefficients in the factors is equal to the sum of the coefficients in the product.

Example 1

(x+ 2) (x + 5)= ×2 + 7x+10

As is seen in the above form,
that

Sc of the product = Product of
the Sc

(1+2) (1+5)=1+7+10

3x6= 1+ 17

18 =18

Sub Sutras

Anurupyena Sutra-

A shortcut method in Vedic mathematics for multiplication that applies
when numbers are not close to a power of 10, but are close to each other or a multiple
of a base number.

6.Anurupyena: Proportionately.
Eg:46X44=Working base: 40
Multiplication base = 10x4=40
Division = 100 /2= 50
46+6
44+4
cross add
50
Product
24 (keep 4 and carry 2)
x4 (mul.base)
200 +carry 2=2024

Sisyate Sesasaminah--

Corollary of the Vedic Mathematics sutra Nikhilam Navatashcaramam Dashatah ("All from 9 and the last from 10") and means “the remainder remains constant.The Vedic math formula "Sisyate Sesasamjnah" is used for multiplication, meaning "the remainder remains constant." A common example is 104× 101:0

1. Find the difference between each number and the base (100):
104- 100 = 4 and 101- 100=1.
2.Multiply these differences:4×1=04.
3. Add the first difference to the second number, or the second difference to the first number: 101 + 4 1 10s (or
104+1= 105)

Adyamadyenantya-mantyena-

Vedic mathematics sutra that means "first by the first and last by the last.
For the equation
2x2+5x-3
, if a factor is found to be
Adyamadyenantyamantya to find the second
using another method like gnurupyeng, you can use
(x+3)
factor.
Divide the first term of the equa on by the first term of the
factor:2x7-x=2x.
Divide the last term of the oquation by the last term of the
factor: -3-3=-1
Combine these results to form the second factor: 2x - 1
This process is demonstrated with the example 287+5x -3.First, the middle term is split into 6x - x to get the first factor (x + 3). Then, the
Adyamadyenantyamantya sutra is opplied: @2x2÷×=2x
3÷3=-1
cond factoris 2x - 1

Kevalaih Saptakam Gunyat-

Vedic mathematics technique, a sub-sutra of the Parayartya Sutra, which means “transpose and adjust".

Vestanam Sutra-

Sub-sutra in Vedic Mathematics that means “by osculation" and is used to simplity divisibility checks, especially for numbers ending in 1, 3, 7, or 9.Positive Osculator: Used in division and multiplication where the last digit is 1.
Negative Osculator: Used when the last digit of the divisor is not 1, requiring multiplication to make it 1.

- Example: To check if 343 is divisible by 7, you find the negative osculator by multiplying 7 by 3 to get 21.The negative osculator is 2.Then you use this osculator and the last digit to determine if 343 is divisible by 7. @

Yavadunam Tavadunam Sutra-

10 (like 10, 100, 1000).
Vedic mathematics technique for squaring numbers close to a power of
Example: 98?
1. Deficiency:98 - 100=-2.
2. Square the deficiency:(-27=4.
3. Subtract the deficiency from the number: 98 -2 = 96.
4. Combine: 9604 (using two digits for the deficiency part because the base is 100)

Yavadunam Tavadunikrtya

Vargancha Yojayet.
Is a formula in Vedic mathematics that is used to find the squares of numbers that are close to powers of 10 (10, 100, 1000, etc.). This means, subtract its deficiency from the number and write the sguare of that deficiency.
SQUARE OF 8
10 - 8=2, SQUARE OF 21s 4
8-2=6
THus, SQUARE OF 8 = 64

Antyardeshkepi-

A term that refers to the Vedic mathematics method Antyayordasake's pi, also known as Antyardeshkepi, used for multiplication.
If's a technigue where the sum of the unit digits is 10, and the preceding digits are the same, The multiplication is done by multiplying the preceding digits with one more than that digit, and then multiplying the unit digits together.1. ldentty the numbors: Uhe twonunbers where the sum of the las dgis is 10 and the other digts are the same leg. 24×20), 。2. lut purto thenswern unpy meron.untdgtbycanemor than iteol
· 24x26 menmmunt dgı2
·Multijpy2x(2+1)=2x3=6.0
3. Roht part of theanswer.wumepytheunt ágits togeter
· For 24x 26: The unit digits sre 4 ands
· Multipy4x6=24.
4. Combinethe parts. Comtine theresultstrambodh sdeps to get the inal answver.

Antyayoreva-

A Vedic Mathematics sutra meaning "only the last terms" or "only the last digits”.
Multiplication Application (e.g., by 1)
When multiplying anumber by 11, this sutra provides a shortcut:
1. Wite the last digit of the number asis
2. Add the last diglt to the next digilt to its left, and place this sum between them.
3. Continue thls process, addingadjacent digits untl the first dilgit of the original number is reached

Example: To multiply 35 by 11:01. Write the last diait, 5.
2. Add 3+5 =8, andplacelitbelore the 5
3. Wite the first digit, 3, before the 8.
4. The result is 385.

Samuccayagunitah-

Vedic mathematics sub-sutra that means “the product of the sums" or the sum of the products, " used to verify calculations.

· Example: For the multijplication (x + 3)(x + 2), the sum of the coefficients in the factorsis (1 +3)×(1+2)=4×3=12.The product is .xP + 5r + 6, and the sum of its coefficients is 1+5+6=12, which confirms the result

lopanasthapanabhyam-

Vedic mathematics sutra that means “by alternate elimination and retention.
It is used to solve problems by alternately eliminating one variable to solve for the remaining ones, and it can be applied to problems like factorization of quadratic equations, finding the Highest Common Factor (HCF), and
solving simultaneous equations.

• Example t: Find the HCF of x7+ 5x +4andx2+7x+6.
· Method: Subtract the two expressions.•Calculation:
·(22+7x+6)-(82+5x+4)=2x+2
· Result: The HCFis (x + l), whichis a factor of both 2x + 2 and the original polynomials

Examole: Factor the exoressior
38479+29411824702+62?.

◦ Method: Tomporarly set one varlable to zero to roduce the problem
◦ Step1:Put z = 0.The expressionbecomes307+7xy+20?◦ Step 2: Factor the resultinaauadratic expression, which aives (3x +y)(x+2y).
◦ Stop 3: Wth y = 0, the original expression become
341182462.hls factors to (3x +22)(× +.32).
Step 4:With x = 0, the expressionbecomes 27+7yz+62?This factors to (2y+32)(y+ 2z).

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Vedic mathematics concept that means “by mere observation" and is used for two main purposes: fast addition (also called spark addition) and finding the square root of pertect squares

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  - · Sum of coefficients of factors;
  (1 + 1)(1 +2)(1+3)=(2)(3)1(4)=24. 0
- Sum of coefficients of the product: 1 +6+11+6=24.0· Since 24 = 24, the result is verified.

Thank You

VEDIC MATHEMATICS

Late Raja Shri Virendra Bhadur College
Saraipali

By - Piyush Sahu

SYNOPSIS

- What is Vedic Mathematics ?
- About Bharati Krishna Tirtha
- Features of Vedic Mathematics
- Types of Sutra And Sub-Sutra
- Sutra
- Subsutra

WHAT IS VEDIC MATHEMATICS ?

- Vedic Mathematics, which has its roots in the ancient Vedas, can be defined as mathematical calculation systems, re-discovered in the early 20th century by Swami Bharati Krishna Tirthaji (Between 1911 and 1918). This ancient-rooted system of mathematics originating in India is popular for how it simplifies arithmetic operations and problem-solving. It is foundational on the techniques of Veda, ancient Indian scriptures and focuses on methods of mental calculations making computations quicker and more efficient.

About Bharati Krishna Tirtha

- Jagadguru Shankaracharya Swami Bharati Krishna Tirtha was an Hindu Monk and born in Puri , Orrisa 14 March 1884.
- He was born in a Tamil Brahmin family. His real name was Venkataraman Shastri.
- He gained his popularity from his book on Vedic Mathematics.

Features of Vedic Mathematics

- Integrity: The 16 Sutras in Vedic maths are all interrelated to facilitate better understanding. A single sutra can be used for solving multiple arithmetic calculations by following one rule.
- Simplicity: Vedic mathematics is known for its simplicity which allows the solving of complicated multiplication problems by using only one single and simple step.
- Creativity: Vedic maths takes into consideration all the perception that needs creativity and stress on understanding that there are multiple ways to solve a problem.
- Quick and Accurate Result: Vedic maths emphasizes mental calculation as the main strategy. The simple calculation allows time saving, increased productivity and fewer steps to solve problems leading to a higher probability of accurate results.
- Algebraic Connection: Students can easily apply this Vedic maths method of calculation in solving any algebraic problem.

TYPES OF SUTRA AND SUB-SUTRA

Vedic Maths Sutras

Sutras

1. Ekadhiken Purvena
2. Nikhilam Navatacharamam Dasatah
3. Urdhva-tiryagbhyam
4. Paravartya Yojayet
5. Sunyma Samyasamuchaye
6. Sunyamanyat
7. Sankalana-vyavakalamnabyam
8. Puranapuranabhyam
9. Chalana-Kalanabhyam
10. Yavadunam
11. Vyastisamastih
12. Sesanyankena Caramena
13. Sopantyadvayamantyam
14. Ekanyunena Purvena
15. Gunitasamuccayah
16. Gunakasamuccayah

Sub-sutras

1. Anurupyena
2. Sisyate Sesajnah
3. Adyamadyenantya-mantyena
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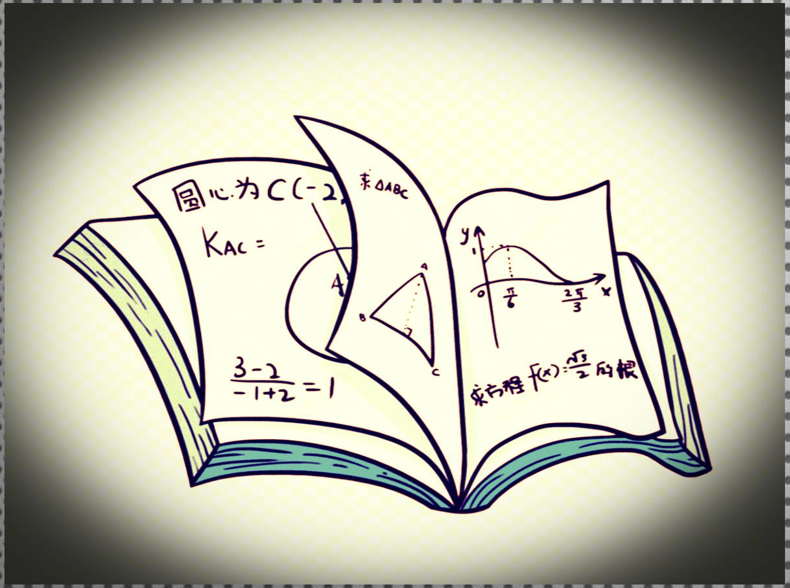
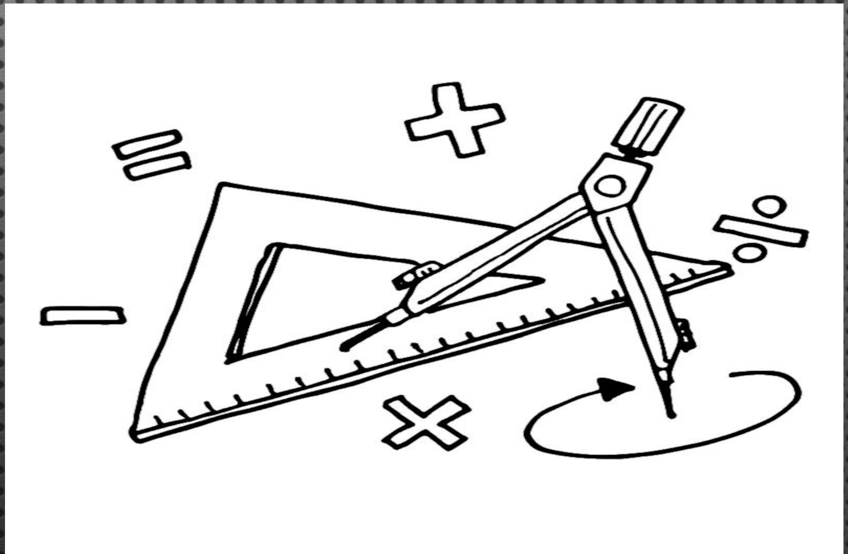
9. Antyayoreva
10. Samuccayagunitha
11. Lopanasthapanabhyam
12. Vilokanam
13. Gunitasamuccayah Samuccayagunitah



SUTRA



1. Ekadhikena Purvena

- **Meaning:** By one more than the previous one.
- **Example (Squaring numbers ending in 5):** To find 35^2:
  - Take the "previous" digit, which is 3.
  - Multiply it by "one more than the previous one" (3 + 1 = 4). So, 3 \times 4 = 12.
  - Take the last digit (5) and square it: 5^2 = 25.
  - Combine the two parts: **1225**.

2. NIKHILAM NAVATASHCARAMAM DASHATAH

- Meaning: All from 9 and the last from 10.
- Example (Subtraction from 1000): To solve 1000 - 473:Apply "All from 9" to the first digits (4 and 7): 9 - 4 = 5 and 9 - 7 = 2.Apply "the last from 10" to the last digit (3): 10 - 3 = 7.The answer is 527.

3. Urdhva-Tiryagbhyam

- Meaning: Vertically and crosswise.
- Example (Multiplying 2-digit numbers): To solve 23×41:Vertically (Right): Multiply the right-hand digits: $3 \times 1 = 3$.Crosswise: Multiply diagonally and add: $(2 \times 1) + (3 \times 4) = 2 + 12 = 14$. Write down 4 and carry over the 1.Vertically (Left): Multiply the left-hand digits: $2 \times 4 = 8$.Add the carry-over: $8 + 1 = 9$.Combine the results: 943.

4. Paravartya Yojayet

- Meaning: Transpose and apply.
  Example (Division by numbers near 100): To solve 123 \div 11 (Base is 10, deviation is +1. Transposed is -1):
  Write the divisor (11) as 1, and the transposed deviation (-1) below it. Separate the last digit of the dividend (123) by a line.
  1 | 1 2 | 3
  -1 |
  Bring down the first digit (1).
  Multiply this (1) by the transposed deviation (-1), get -1, and place it under the 2.
  1 | 1 2 | 3
  -1 | -1 |
  Add the second column (2 + (-1) = 1).
  Multiply this (1) by the transposed deviation (-1), get -1, and place it under the 3.
  1 | 1 2 | 3
  -1 | -1 | -1
  | 1 1 | 2
  The answer is Quotient = 11, Remainder = 2.

5. Shunyam Saamyasamuccaye

- Meaning: When the sum is the same, that sum is zero.
- Example (Solving algebraic equations): Solve (x + 3) + (x + 7) = (x + 2) + (x + 8).Notice the sum of the constant terms on the Left Hand Side (LHS) is 3 + 7 = 10.The sum of the constant terms on the Right Hand Side (RHS) is 2 + 8 = 10.Since the "sum is the same" (10 = 10) and the x terms are also balanced (2x = 2x), this sutra implies the variable part (x) is not what makes them equal. This type of equation is a special case that doesn't resolve to a single x value, but the principle is used in more complex forms.A clearer example: Solve 1 / (x+2) + 1 / (x+3) = 0. Here, the sum of the denominators (x+2 + x+3 = 2x+5) is set to zero. So, 2x + 5 = 0, which gives x

6. (Anurupye) Shunyamanyat

- Meaning: If one is in ratio, the other is zero.
- Example (Solving simultaneous equations): Solve:3x + 6y = 12x + 2y = 4Notice the ratio of the coefficients of x (3:1) is the same as the ratio of the coefficients of y (6:2, which is 3:1) and the constants (12:4, which is 3:1).Since the entire second equation is in the same ratio to the first, they are the same line. This implies there are infinite solutions, not a unique one (the "other" value isn't zero in this case, but the relationship is defined by the ratio).A direct application: If 12x = 36y, the ratio of coefficients is 12:36 or 1:3. This implies x = 3y. If we have a system like 12x - 36y = 0, this holds true for any x and y where x=3y.

7. Sankalana-vyavakalanabhyam

- Meaning: By addition and by subtraction.
- Example (Solving simultaneous equations): Solve:4x + 2y = 14 (Eq. 1)3x - 2y = 7   (Eq. 2)By Addition: Add (Eq. 1) and (Eq. 2). The y terms cancel out.(4x + 3x) + (2y - 2y) = 14 + 7 \rightarrow 7x = 21 \rightarrow x = 3.By Subtraction (or substitution): Put x = 3 into (Eq. 1):4(3) + 2y = 14 \rightarrow 12 + 2y = 14 \rightarrow 2y = 2 \rightarrow y = 1.The answer is x = 3, y = 1.

8. Puranapuranabhyam

- Meaning: By the completion or non-completion.
- Example (Solving quadratic equations): To solve $x^2 + 6x = 7$ by "completing the square."To "complete" $x^2 + 6x$, take half of the x-coefficient (which is $6/2 = 3$) and square it ($3^2 = 9$).Add this 9 to both sides to "complete" the square:$(x^2 + 6x + 9) = 7 + 9$This simplifies to $(x + 3)^2 = 16$.Take the square root: $x + 3 = \pm 4$.This gives two solutions: $x = 4 - 3 = 1$ and $x = -4 - 3 = -7$.

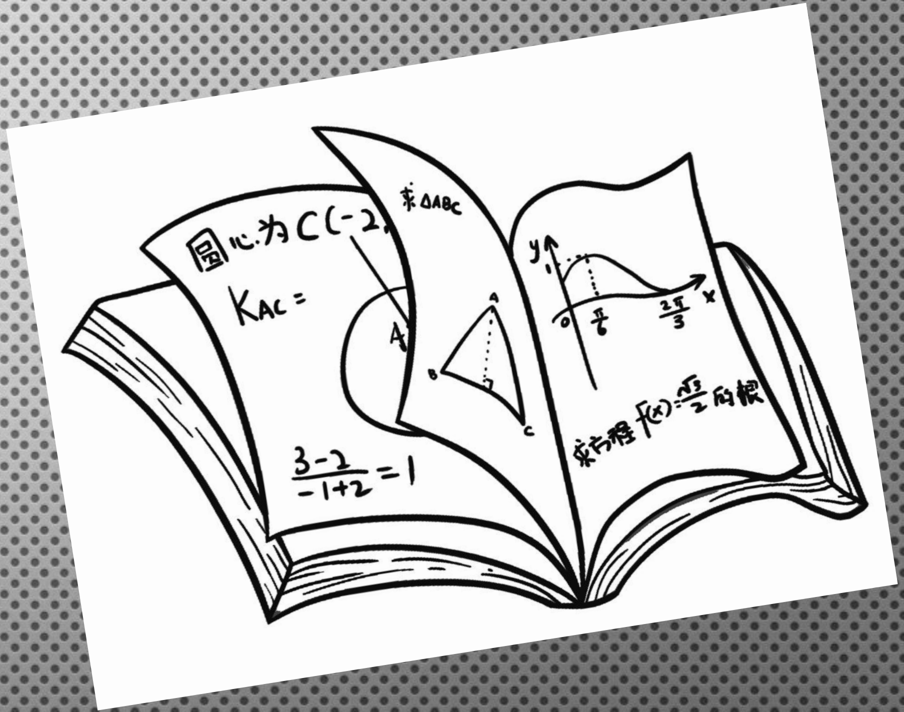
9. Chalana-Kalanabhyam

- Meaning: Differences and Similarities (or Sequential Motion, related to Calculus).
  Example (Finding roots of a quadratic): For a quadratic equation $ax^2 + bx + c = 0$, this sutra relates to the differential $2ax + b$.
  For $x^2 - 8x + 15 = 0$:
  The "calculus" part is $2x - 8$.
  Set this to 0 to find the "turning point": $2x - 8 = 0 \rightarrow x = 4$.
  The roots are symmetric around this point. Let the roots be $4 - k$ and $4 + k$.
  The product of roots is $c/a = 15$.
  $(4 - k)(4 + k) = 15 \rightarrow 16 - k^2 = 15 \rightarrow k^2 = 1 \rightarrow k = \pm 1$.
  The roots are $4 - 1 = 3$ and 4

10. Yavadunam

- Meaning: Whatever the extent of its deficiency.
- Example (Squaring numbers near a base): To find 97^2 (Base is 100).The "deficiency" from 100 is 3 (since 100 - 97 = 3).Subtract the deficiency from the number: 97 - 3 = 94. This is the first part of the answer.Square the deficiency: 3^2 = 9. Since the base has two zeros, write this as 09.Combine the parts: 9409.

11. Vyashtisamanstih



- Meaning: Part and Whole.
- Example (Ratios): A bag contains 4 apples, 8 mangoes, and 12 bananas.The "whole" is the total number of fruits: 4 + 8 + 12 = 24.The "part" for apples is 4.The "part-whole" relationship (fraction) for apples is 4/24 (or 1/6).

12. Shesanyankena Charamena

- Meaning: The remainders by the last digit.
- Example (Finding the decimal for 1/7):Start with 1. The "remainders" are what you get as you perform the division.10 \div 7 = 1 remainder 3.30 \div 7 = 4 remainder 2.20 \div 7 = 2 remainder 6.60 \div 7 = 8 remainder 4.40 \div 7 = 5 remainder 5.50 \div 7 = 7 remainder 1. (The remainder 1 repeats, so the decimal will cycle).The quotients (1, 4, 2, 8, 5, 7) give the answer: 0.142857...

13. SOPAANTYADVAYAMANTYAM

- Meaning: The ultimate and twice the penultimate.
- Example (Solving specific algebraic fractions): For an equation of the form 1 / (x+a)(x+b) + 1 / (x+a)(x+c) = 1 / (x+a)(x+d) + 1 / (x+b)(x+c)A simpler example is: 1/((x+1)(x+2)) + 1/((x+1)(x+3)) = 1/((x+1)(x+4)) + 1/((x+2)(x+3))The sutra provides a direct solution: 2c + d = 0, where c is the "penultimate" and d is the "ultimate" term. In this case, x+3 and x+4.So, 2

14. Ekanyunena Purvena

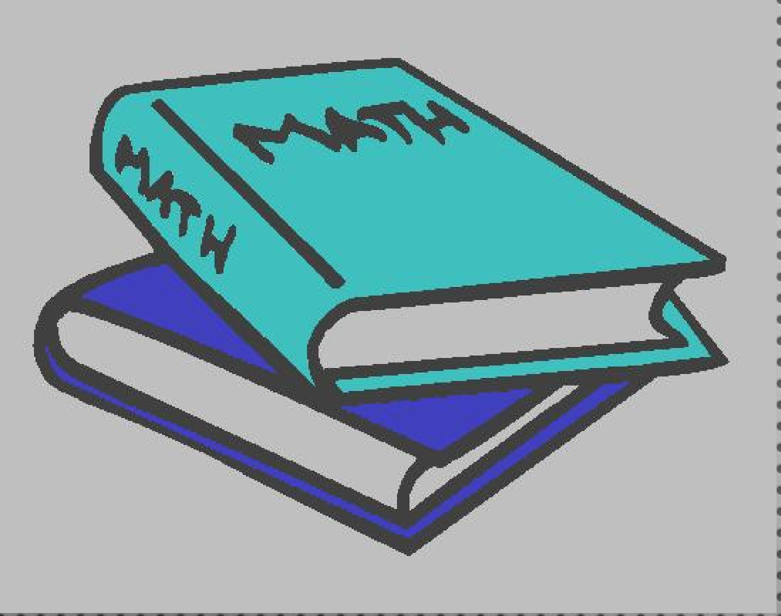
- Meaning: By one less than the previous one.
- Example (Multiplying by 9s): To solve 46 \times 99:First part (one less than the previous): 46 - 1 = 45.Second part (Nikhilam Sutra): Apply "All from 9, last from 10" to 46. (Here, it's simpler: 99 - 45).99 - 45 = 54. (Or, for 46: 9-4=5, 10-6=4 \rightarrow 54).Combine the parts: 4554.

15. Gunitasamuccayah

- Meaning: The product of the sum is equal to the sum of the product.
- Example (Checking factorization): Is $(x + 2)(x + 5) = x^2 + 7x + 10$ correct?Product of the sum (of coefficients):For $(x + 2)$, sum of coefficients is $1 + 2 = 3$.For $(x + 5)$, sum of coefficients is $1 + 5 = 6$.The product of these sums is 3 \times 6 = 18.Sum of the product (of coefficients):For $x^2 + 7x + 10$, the sum of coefficients is $1 + 7 + 10 = 18$.Since $18 = 18$, the factorization is correct.

16. Gunakasamuccayah

- Meaning: The factors of the sum is equal to the sum of the factors.
- Example (Finding a missing factor): This is closely related to the sutra above and is used for the same checking purpose. If you are factoring $x^2 - 5x + 6 = 0$ and find one factor is $(x - 2)$, you can find the other.Sum of coefficients in the "whole" $(x^2 - 5x + 6)$ is $1 - 5 + 6 = 2$.Sum of coefficients in the known factor $(x - 2)$ is $1 - 2 = -1$.Let the unknown factor be $(ax + b)$. The sum of its coefficients is $(a+b)$.The sutra states: $2 = (-1) \times (a+b)$.Therefore, the sum of coefficients in the missing factor must be $a+b = -2$.We can see the other factor is $(x - 3)$, and its sum of coefficients is $1 - 3 = -2$. This confirms the answer



SUB SUTRA

1. ANURUPYENA

- Meaning: Proportionately.
  Example (Multiplication using a working base): To solve 42×44 (near 40, not 10 or 100).
  Use a working base of 40 (which is 10×4).
  Deviations from 40 are +2 and +4.
  Cross-add: $42 + 4 = 46$ (or $44 + 2 = 46$).
  Apply proportion: Multiply this result by the base factor (4): $46 \times 4 = 184$.
  Multiply the deviations: $2 \times 4 = 8$.
  Combine the parts: 1848.

2. Sisyate Sesasamujnah

- Meaning: The remainder remains constant.
- Example (Checking divisibility by 7): To check if 91 is divisible by 7.The "osculator" (a constant remainder-based multiplier) for 7 is -2 (or +5). Let's use 5.Take the last digit (1), multiply by 5, and add to the rest: (1 \times 5) + 9 = 5 + 9 = 14.Is 14 divisible by 7? Yes.Therefore, 91 is divisible by 7. This "remainder" process is constant.

3. Adyamadyenantyamantyena

- Meaning: The first by the first and the last by the last.
- Example (Algebraic multiplication): To find the first and last terms of (2x + 3)(4x + 5).First by the first: 2x \times 4x = 8x^2.Last by the last: 3 \times 5 = 15.The full answer is 8x^2 + ... + 15. (The middle term is found with Urdhva-Tiryagbhyam).

4. Kevalaih Saptakam Gunyat

- Meaning: For 7 the multiplicand is 143 (a specific mnemonic).
- Example (To find 1/7): This is a memory aid. 1/7 = 0.142857… The digits 1, 4, 2, 8, 5, 7 are a repeating sequence.

5. VESTANAM

- Meaning: By osculation (related to Sisyate Sesasamjnah).
- Example (Checking divisibility by 9): To check if 432 is divisible by 9.The osculator for 9 is 1 (add the digits).4 + 3 + 2 = 9.Since 9 is divisible by 9, 432 is divisible by 9.

6. Yavadunam Tavadunam

- Meaning: Lessen by the deficiency (a part of the Yavadunam sutra).
- Example (Finding the cube of 98): (Base 100, Deficiency is 2)Lessen the number by twice the deficiency: 98 - (2 \times 2) = 94. This is the first part.(Middle part): 3 \times (\text{deficiency})^2 = 3 \times (2^2) = 12.(Last part): (\text{deficiency})^3 = (2^3) = 8. (Write as 08).Combine: 941208.

7. Yavadunam Tavadunikritya Varganca Yojayet

- Meaning: Whatever the deficiency, lessen by that amount and set up the square of the deficiency.
- Example (This is the full Yavadunam Sutra 10): To find 97^2.Deficiency is 3.Lessen by that amount: 97 - 3 = 94.Set up the square of the deficiency: 3^2 = 09.Answer: 9409.

8. ANTYAYORDASAKE'PI

- Meaning: Last digits totaling 10.
  Example (Multiplying numbers with same first digits, last digits sum to 10): To solve 62 \times 68.
  The last digits (2+8) sum to 10, and the first digits (6) are the same.
  Last part: Multiply the last digits: 2 \times 8 = 16.
  First part: Use Ekadhikena Purvena (one more than the previous) on the first digit: 6 \times (6+1) = 6 \times 7 = 42.
  Combine: 4216.

9. Antyayoreva

- Meaning: Only the last terms.
- Example (Specific algebraic factorization): To factor $x^2 + 7x + 12$.The "last term" is 12.We need two numbers that multiply to 12 ("only the last terms") and add to the middle term, 7.The factors of 12 are (1, 12), (2, 6), (3, 4).3 + 4 = 7.The factors are $(x + 3)$ and $(x + 4)$.

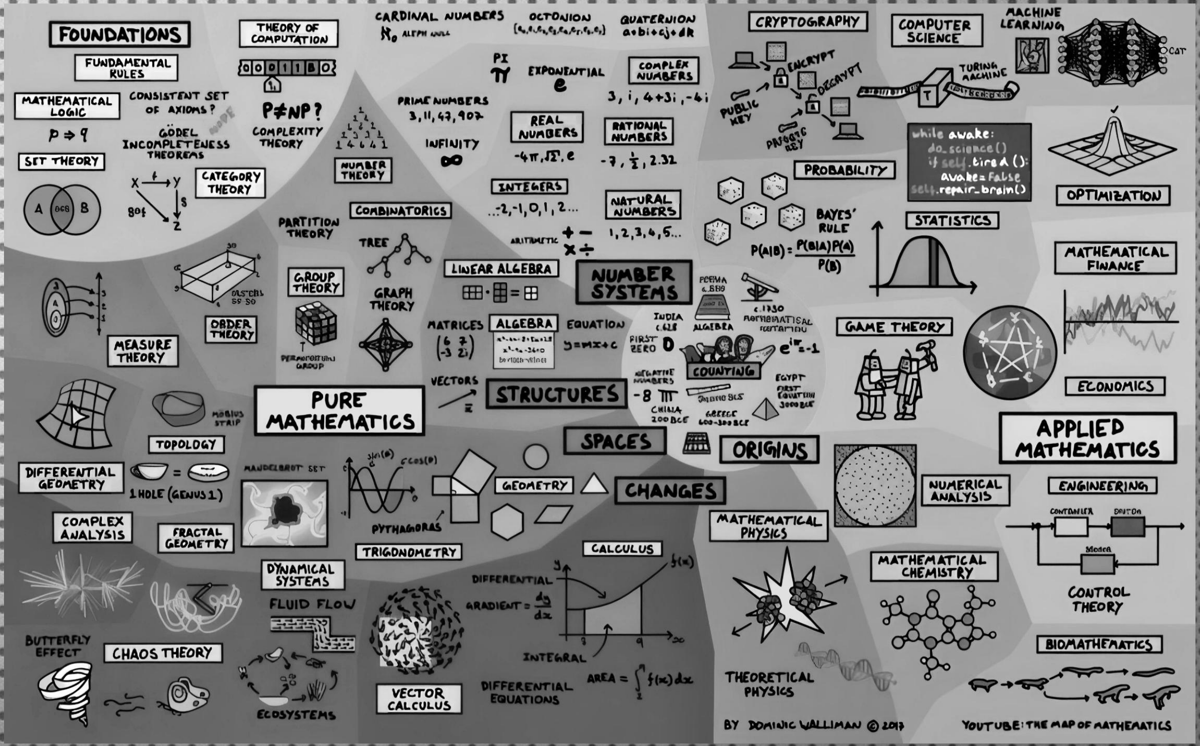
10. SAMUCCAYAGUNITAH

- Meaning: The sum of the coefficients in the product
- Example (This is part of Sutra 15): Checking $(x+3)(x+4) = x^2+7x+12$. Sum of coefficients in the product: $1 + 7 + 12 = 20$. This must equal the product of the sums of coefficients in the factors: $(1+3) \times (1+4) = 4 \times 5 = 20$. Since $20 = 20$, it is correct.

11. LOPANASTHAPANABHYAM

- Meaning: By alternate elimination and retention
- Example (Finding the HCF): To find the HCF of $x^2 + 7x + 12$ and $x^2 + 8x + 15$.By Subtraction (Elimination): $(x^2 + 8x + 15) - (x^2 + 7x + 12) = x + 3$.This difference, $(x + 3)$, is the highest common factor (HCF).

12. Vilokanam



- Meaning: By mere observation.
- Example (Solving simple equations): To solve $x + 5 = 8$.By "mere observation," you can see that the number which, when added to 5, gives 8, is 3.$x = 3$.

13. Gunitasamuccayah Samuccayagunitah

- Meaning: The product of the sum is the sum of the products (a combination of Sutras 15 & 16).
- Example (Checking): This is the full check used in Sutra 15.Check: $(x + 1)(x + 2) = x^2 + 3x + 2$.Product of Sums: $(1+1) \times (1+2) = 2 \times 3 = 6$.Sum of Product: $1 + 3 + 2 = 6$.They match.

THANK YOU

ORIGIN OF VEDIC MATHS

Ancient Indian Method of fast calculations

By Rohan Bhoi

BSc 1st semester

INTRODUCTION OF VEDIC MATHS

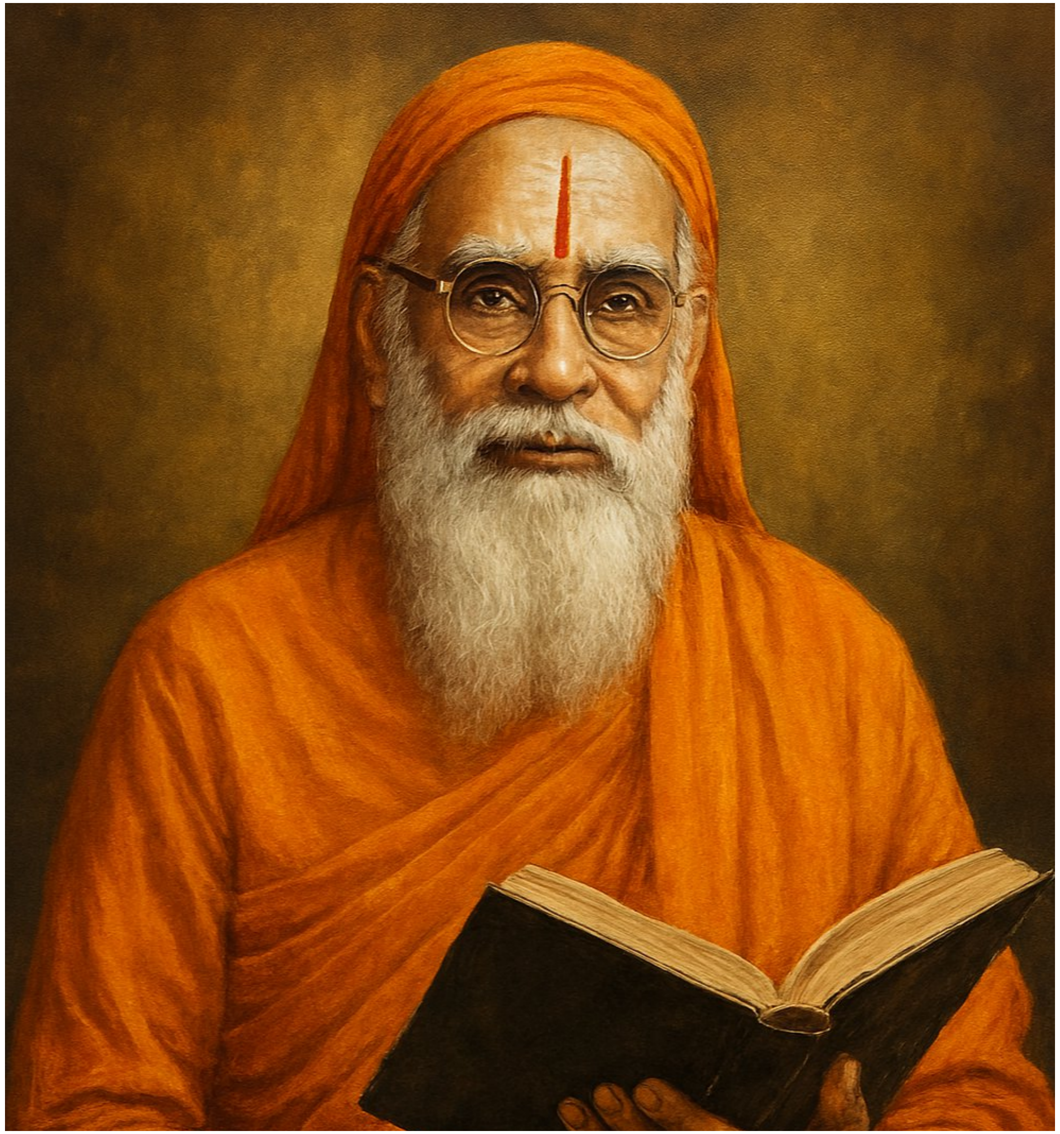
- **Vedic Mathematics** is an ancient system of mathematics that originated in India. It is based on 16 sutras (aphorisms) and 13 sub-sutras (corollaries) derived from the **Vedas**, the ancient Indian scriptures. This system was rediscovered and compiled in the early 20th century by **Swami Bharati Krishna Tirthaji Maharaj**, who claimed that all of mathematics is based on these simple, elegant principles.

Key Features:

- **Speed & Simplicity**: Enables faster mental calculations
- **Versatility**: Applies to arithmetic, algebra, geometry, calculus, and more
- **Creativity**: Encourages multiple ways to solve a problem
- **Mental Agility**: Enhances concentration and memory

ABOUT SWAMI BHARATI KRISHNA TIRTHAJI

- **Birth Name:** Venkataraman Shastri
- **Born:** March 14, 1884, in Tirunelveli, Tamil Nadu, India
- **Died:** February 2, 1960
- **Education:** Studied at the University of Madras; excelled in Sanskrit, mathematics, philosophy, and science
- **Spiritual Role:** Became the **Shankaracharya of Govardhan Matha** in Puri, Odisha — one of the four cardinal monastic institutions in India



HIS CONTRIBUTION IN VEDIC MATHS

- **Rediscovery of Sutras:** Between 1911 and 1918, he claimed to have reconstructed 16 mathematical *sutras* (aphorisms) and 13 *sub-sutras* from ancient Vedic texts that had been largely overlooked or dismissed by other scholars.
- **Book:** Authored *Vedic Mathematics*, published posthumously in 1965, which introduced these sutras and demonstrated their application in arithmetic, algebra, geometry, and calculus.
- **Philosophy:** He believed mathematics should be intuitive, fast, and joyful — not burdensome. His methods emphasize mental calculation and pattern recognition.

LEGACY AND IMPACT

- His work has inspired a global movement to integrate Vedic Maths into school curricula.
- Vedic Maths is now taught in many countries as a tool for improving mental agility and problem-solving speed.
- He is remembered not only as a mathematician but also as a spiritual teacher who bridged ancient wisdom with modern education.

WHAT ARE SUTRAS AND SUB-SUTRAS?

List of 16 Sutras

Sutras = main formula

Sub-Sutras = supporting principles

- Ekadhikena Purvena
- Nikhilam Navatacharamam dasatah
- Urdhva-triyaghyam
- Paravarvartya Yojayet
- Sunyma Sunyamamuchaye
- Sunyamanyat
- Sankalana- vyavakalanamnabyam
- Puranapuranabhyam
- chalanaKAlanabhyam
- Yavadunam
- Vyastisamastih
- Sesanyankena Caramena
- Sopantyadvayamantyam
- Ekanyunena purven
- Gunitasamuccayah
- Gunakasamuccayah

List of Sub-sutras

- Antyayor Daśake’pi
- Sopāntyadvaya-mantyam
- Ekaadhikena Purvena
- Parāvartya Yojayet
- Calana-Kalanābhyām
- Gunitasamuccayah
- Gunita Samuccayah
- Yāvadunām Tavat irek ena Varga Yojayet
- Antyayoreva
- Antyayor Ekād hikād duḥitayoh
- Ardhasamuccayah Samuccayoh
- Eka nyūnena Śeseṇa
- Śeṣānyankena Caramena

EKADHIKENA PURVENA

By one more than the one before

Useful for squaring numbers ending in 5.

- *How to use*: e.g., 25^2 → 2 × (2+1) = 6 → attach 25 → 625.
  Why useful: very fast mental method for certain squares.

Nikhilam Navataścaramam Daśataḥ

(All from 9 and the last from 10)

Useful when multiplying numbers near a power of 10.

- *How to use*: e.g., multiply 98×97 by taking difference from base 100 etc.
  Why useful: simplifies large-number multiplication.

Urdhva-Tiryagbhyām

(Vertically and crosswise)

General method for multiplication of large numbers.

- *How to use*: e.g., multiply 32×14 by using vertical + cross products.
  Why useful: versatile for any size numbers.

Parāvartya Yojayet

(Transpose and apply)

Technique often for division with large divisors.

- *How to use*: change the problem into simpler terms by transposing etc.
  Why useful: helps in division where traditional methods are slow.

Śūnyam Sāmyasamuccaye

(When the sum is the same, that sum is zero)

Useful in algebraic simplifications.

- *How to use*: If terms have common sum, set sum = 0.
  Why useful: simplifies solving equations.

(Ānūrpye) Śūnyam Anyat

(If one is in ratio, the other is zero)

Ratio-based method.

- *How to use*: When numbers are in certain proportion, one term becomes zero.
  Why useful: simplifies proportion problems.

Sankalana-Vyavakalanābhyām

(By addition and by subtraction)

Addition/subtraction strategy

- *How to use*: restructure sums/differences by converting to easier forms.
  Why useful: speeds up basic operations

Pūranāpurāṇābhyām

(By the completion or non-completion)

Technique for completing to base.

- *How to use*: e.g., fill up to the nearest base then adjust.
  Why useful: handy for subtraction or division.

Chalana-Kalanābhyām

(Differences and similarities)

For changes/deviations.

- *How to use*: use difference relationships to simplify.
  Why useful: useful for pattern recognition.

Yāvadunām

(Whatever the extent of its deficiency)

Often used for squares/roots.

- *How to use*: if a number is “d” less than base, then use d etc.
  Why useful: simplifies root & square operations.

Vyastisamastih

(The specific and general)

Separately the particular from the general.

- *How to use*: separate components to simplify.
  Why useful: good for complex expressions.

Śeṣānyankena Caramena

(The remainder by the last digit)

Useful for division / recurring decimals.

- *How to use*: use remainder logic with last digits.
  Why useful: quick check/trick for division.

Sopāntyadvaya-mantyam

(The ultimate and twice the penultimate)

Another trick method.

- *How to use*: use last two digits method for certain multiplications/divisions.
  Why useful: fast mental evaluation.

Ekaṃ Yūnena Purvena

(By one less than the previous one)

For division or squares near base.

- *How to use*: if number is just less then base, use one less strategy.
  Why useful: speeds up subtraction/square near base.

Gunitasamuccayah

(The product of the sum)

<u>A product/sum relation.</u>

- *How to use*: for multiplication involving sum of terms.
  Why useful: simplifies algebraic products.

Gunakasamuccayah

The factors of the sum)

Similar to above but inverse.

- *How to use*: find factors of sum to simplify product.
  Why useful: useful in factorisation.

Sub-Sutras
13 sub-sutras:

•**Antyayor Daśake’pi** (The last digit remains the same)
Meaning/How to use/Why useful
•**Sopāntyadvaya-mantyam** (The last two of the last) — Note: overlaps with main in some lists
•**Ekaadhikena Purvena** (One more than the previous)
•**Parāvartya Yojayet** (Transposition and adjustment)
•**Calana-Kalanābhyām** (Differences and similarities)
•**Gunitasamuccayah** (The product of the sum)
•**Gunita Samuccayah** (The sum of the products)
•**Yāvadunām Tavat irek ena Varga Yojayet** (By one less than the one so much is the square)
•**Antyayoreva** (Only the final two terms)
•**Antyayor Ekād hikād duḥitayoh** (On the last two digits)
•**Ardhasamuccayah Samuccayoh** (The sum of half-sums is the sum)
•**Eka nyūnena Śeseṇa** (One less than the one followed by the last)
•**Śeṣānyankena Caramena** (The last by the last, and the ultimate by one less than the last)

Thankyou
for your kind attention
presentation by Rohan Bhoi

MATHEMATICS
(VEDIC MATHS)

PRESENTATION BY RANI BANSAL
(B.COM 1ST SEM.)
GUIDED BY MR. RAJ KISHOR SIR

HISTORY OF VEDIC MATHS

- VEDIC MATHEMATICS IS AN ANCIENT INDIAN SYSTEM OF MATHEMATICS DERIVED FROM THE ATHARVA VEDA. IT WAS REDISCOVERED BY JAGADGURU SWAMI BHARATI KRISHNA TIRTHAJI BETWEEN 1911 AND 1918, WHO COMLIED 16 SUTRAS AND 13 SUB –SUTRAS FOR QUICK AND EASY CALCULATIONS . HIS BOOK "VEDIC MATHEMATICS" WAS PUBLISHED IN 1965. IT HEPLS IN SOLVING MATHEMATICAL PROBLEMS FASTER AND IS WIDELY USED TODAY TO IMPORVE SPEED, ACCURACY ,AND MENTAL ABILITY.

BENEFITS OF VEDIC MATHS

- INCREASES SPEED AND ACCURACY
- BOOSTS MEMORY AND CONCENTRATION
- IMPROVES NUMBER SENSE
- MAKE MATHS MORE FUN AND LESS SCARY

DISADVANTAGE OF VEDIC MATHS

- NOT WIDELY RECOGNIZED ACADEMICALLY
- LIMITED SCOPE
- REQUIRES GOOD CONCENTRATION
- CONFUSING FOR NEW LEARNERS
- DIFFERENT FROM MODERN METHODS

ABOUT SUTRAS AND SUB SUTRAS

16 SUTRAS

1. EKADHIKENA PURVENA
2. NIKHILAM NAVATASCARAMAM DASATAH
3. URDHVA TIRYAGBHYAM
4. PARAVATYA YOJAYET
5. SUNYAM SAMYASAMUCCAYE
6. SUNYAMANYAT
7. SANKALANA-VYAVAKALANABHYAM
8. PURANAPURANABHYAM
9. CHALANA-KALANABHYAM
10. YAVADUNAM
11. VYASHTI –SAMASHTI
12. SESANYANKENA
13. SOPANTYADVAYAMANTYAM
14. EKANYUNENA PURVENA
15. GUNITASAMUCCAYAH
16. GUNAKASAMUCCAYAH

13 SUB-SUTRAS

1. ANURUPYE SUNYAMANYAT
2. SISYATE SESASAMJNAH
3. ADYAMADYENANTYAMANTYENA
4. KEVALAIH SAPTAKAM GUNYAT
5. VESTANAM
6. YAVADUNAM TAVADUNAM
7. YAVADUNAM TAVADUNIKRTYA VARGAM CHA YOJAYET
8. ANTYAYOREVA
9. SAMUCCAYAGUNITAH
10. LOPANASTHAPANABHYAM
11. VILOKANAM
12. GUNITASAMUCCAYAH SAMUCCAYAGUNITAH
13. DHVAJANKA

EXPLANATION OF 16 SUTRAS

1.Ekādhikena Pūrvena – "By one more than the previous one."
→ Used for squaring numbers ending in 5.

Example: $25^2 = 2\times3|25 = 625$

2.Nikhilam Navataścaramam Daśatah – "All from 9 and the last from 10."
→ Quick multiplication using complements.

Example: $97\times98=(100-3)(100-2)=9406$

3.Ūrdhva–Tiryagbhyām – "Vertically and crosswise."
→ General multiplication formula.

Example: $12\times13=(1\times1)|(1\times3+2\times1)|(2\times3)=156$

4.Parāvartya Yojayet – “Transpose and adjust.”
→ Used for division and algebraic simplification.

Example: 1/(1−3x)=1+3x+9x2+…

5.Śūnyam Sāmyasamuccaye – “When the sum is the same, that sum is zero.”
→ Helps in solving equations quickly.

Example: (x+2)/(x+3)=(y+2)/(y+3)⇒x=y

6.(Ānurūpye) Śūnyam Anyat – “If one is in ratio, the other is zero.”
→ Useful in proportional equations.

Example: If 3x=6y3, then x/y=2⇒ difference = 0.

7.Sankalana–Vyavakalanābhyām – “By addition and subtraction.”
→ Used to solve simultaneous equations.
Example: x + y =10,x-y=2=>x=6 and y=4

8.Pūranāpūranābhyām – "By completion or non-completion."
→ Simplifies division or factorization.

Example: $43\times47=(45-2)(45+2)=452-22=2025-4=2021$

9.Chalana–Kalanābhyām – "Difference and Similarity."
→ For solving differential equations.

Example: $dy/dx=3x2 \Rightarrow y=x^3+C$

10.Yāvadūnam – "Whatever the deficiency."
→ Multiplying numbers close to base (10,100…).

Example: $98\times97=100-(2+3)|06=9406$

11.Vyāsti–Samasthi – "Whole and part."
→ For algebraic expansions and simplifications.

EXAMPLE: ($a + b)^2 = a^2 + 2ab + b^2$

12.Śeṣānyankena – “The remainders by the last digit.”
→ Used for finding remainders or divisibility.

Example: Divisibility by 9 → Sum of digits must be multiple of 9.

13.Sopāntyadvayamantyam – “The ultimate and twice the penultimate.”
→ Divisibility rule for 9, 11, 13 etc.

Example: For 1287 (×11 test): (7 + 2×8 + 1) = 24 → Not divisible
.
14.Ekanyūnena Pūrvena – “By one less than the previous.”
→ Used in recurring decimals.

Example: 1/19=0.052631578947368421

15.Gunitasamuccayah – “The product of sums.”
→ Used in factorization.

Example: $(x+a)(x+b)=x^2+(a+b)x+ab$

16.Gunakasamuccayah – “The factors’ sum is the same.”
→ If factor sums are equal, product ratios are equal.
EXAMPLE: (X+2) (X+3) AND (X+1) (X+4) = SAME SUM = SAME PRODUCT PATTERN

EXPLANATION OF 13 SUB-SUTRAS

1.Ānurūpye Śūnyam Anyat – "If one ratio, the other is zero."
→ Helps balance proportions.

Example: $2x=4y \Rightarrow x/y=2$

2.Sisyate Śesasamjnah – "The remainder remains."
→ For finding remainders after division.

Example: $23 \div 5=4$ remainder 3

3.Ādyamādyenantyamantyena – "First by first and last by last."
→ Multiplying binomials.

Example: $(a+b)(c+d)=ac+ad+bc+bd$

4.Kevalaih Saptakam Gunyat – "Multiply by 7 only."
→ Shortcut for recurring decimals.

Example: $1/7=0.142857\overline{}$

5.Vestanam – "Osculation (casting out)."
→ Used for divisibility tests.

Example: For 987 by 7 → 98 – 2×7 = 84 (divisible)

6.YAVADUNAM TAVADUNAM –Whatever the deficiency , lessen by that.

EXAMPLE: 98×98 = (98-2)|(2^2)=9604

7.Yāvadūnam Tāvadūnīkritya Vargañca Yojayet – "Whatever the deficiency, subtract it and add its square."

Example: 94^2=(100−6)^2=10000−1200+36=8836

8.Antyayoreva – "Only the last terms."
→ Multiply last digits for partial results.

Example: 24×14⇒ last digits 4×4=16

9.Samuccayagunitah – "Product of the sum."
→ Used in equation factorization.

Example: (x+a)(x+b)=x^2+(a+b)x+ab

10.Lopanasthāpanābhyām – “By elimination and retention.”
→ Solving equations by eliminating variables.

Example: Eliminate yyy from 2x+3y=8,3x+2y=72x+3y=8, 3x+2y=72x+3y=8,3x+2y=7

11.Vilokanam – “By mere observation.”
→ Quick mental calculation by inspection.

Example: 25×4=100 (obvious mentally)

12.Gunitasamuccayah Samuccayagunitah – “Product sum equals sum product.”
→ Equality of ratios or symmetric equations.

Example: (x+1)(x+2)=(x+3)(x+0) ⇒ same sum ⇒ equal product.

13.Dhvajanka – “Flag digit.”
→ Used in square root and division shortcuts.

Example: √2025 = 45 using flag digits.

THANK YOU!

Thank you for your Support

Late raja Virendra bahadur Singh govt college saraipali.

Name – sahiba parveen
Class – b.com 1st semester.
Subject – maths.
Topic – Vedic mathematics.

Submitted by – sahiba parveen

Guided by – Mr. . Raj Kishore Sir

Introduction of Vedic mathematics

1. **Vedic Mathematics** is an ancient Indian system that makes solving math problems fast and easy using simple formulas called **Sutras**.

2. It helps improve **speed, accuracy, and mental calculation skills** in mathematics.

Origin of Vedic mathematics

1. **Vedic Mathematics** originated in **ancient India** and is based on the **Vedas**, especially the *Atharva Veda*.
2. It was later rediscovered and developed by **Swami Bharati Krishna Tirthaji** in the **early 20th century**.

Importance of Vedic mathematics

Importance of Vedic Mathematics:

1. It helps to solve math problems quickly.
2. It improves memory and concentration.
3. It makes difficult problems easy.
4. It builds confidence in students.
5. It removes fear of mathematics.
6. It saves time in competitive exams.

Based on sutras and subsutra's

testbook

Vedic Maths Sutras

Sutras

1. Ekadhiken Purvena
2. Nikhilam Navatacharamam Dasatah
3. Urdhva-tiryagbhyam
4. Paravartya Yojayet
5. Sunyma Samyasamuchaye
6. Sunyamanyat
7. Sankalana-vyavakalamnabyam
8. Puranapuranabhyam
9. Chalana-Kalanabhyam
10. Yavadunam
11. Vyastisamastih
12. Sesanyankena Caramena
13. Sopantyadvayamantyam
14. Ekanyunena Purvena
15. Gunitasamuccayah
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Sub-sutras

1. Anurupyena
2. Sisyate Sesajnah
3. Adyamadyenantya-mantyena
4. Kevalaih Saptakam Gunyat
5. Vestanam
6. Yavadunam Tavadunam
7. Yavadunam Tavadunikrtya Varganca Yojayet
8. Antyayoradaskaepi
9. Antyayoreva
10. Samuccayagunitha
11. Lopanasthapanabhyam
12. Vilokanam
13. Gunitasamuccayah Samuccayagunitah

Sutra's

Ekadhiken Purvena.

Meaning: "One more than the previous one."

Use: To find the square of numbers ending with **5**.

Steps:

1. Take the number before 5.
2. Multiply it by **one more than itself**.
3. Write **25** at the end.

Examples:

✅ **25^2** → 2 × 3 = 6 → write 25 → **625**

✅ **45^2** → 4 × 5 = 20 → write 25 → **2025**

Nikhilam navatacharamam dasatah

Meaning:
"Nikhilam Navatacharamam Dasatah" means **"All from 9 and the last from 10."**
Rule:
- Take the number you want to subtract from a power of 10.
- Subtract **all digits from 9 except the last digit**, which you subtract from 10.

Example 1: Subtract 87 from 100
- Step 1: 100 − 87
- Step 2: Subtract all but last from 9 → 9 − 8 = 1
- Step 3: Subtract last digit from 10 → 10 − 7 = 3

✅ **Answer: 13**

Example 2: Subtract 456 from 1000
- Step 1: 1000 − 456
- Step 2: 9 − 4 = 5, 9 − 5 = 4
- Step 3: 10 − 6 = 4

✅ **Answer: 544**

Urdhva tiryagbhyam

Meaning: “Vertically and crosswise.”
Use: Quick multiplication of numbers.

Examples:

1️⃣ **12 × 13**

- Units: 2 × 3 = 6
- Cross: (1×3) + (2×1) = 5
- Tens: 1 × 1 = 1

✅ **Answer: 156**

2️⃣ **21 × 23**

- Units: 1 × 3 = 3
- Cross: (2×3) + (1×2) = 8
- Tens: 2 × 2 = 4

✅ **Answer: 483**

Paravartya yojayet

Meaning:
“**Transpose and adjust**.”
It is a Vedic Math sutra used for **division**, especially when dividing by numbers near powers of 10 (like 9, 99, 999…).
Use:
•Helps to divide numbers **quickly** without long division.

Examples:
1 **Divide 1234 by 9**
•9 is close to 10 → use **Paravartya Yojayet**
•Divide step by step → **Quotient = 137, Remainder = 1**
2 **Divide 987 by 11**
•11 is near 10 → use **Paravartya Yojayet**
•Step by step → **Quotient = 89, Remainder = 8**

Sunyma samyasamuchaye

Meaning :
If the sum of some terms is the same, you can **combine them smartly** to make calculation easier.
It's mainly used to **simplify expressions or fraction**

Example 1:
Simplify:

$$\frac{3}{5+2} + \frac{2}{2+5}$$

Step 1: Notice the **sum in denominator is same**: 5+2 = 2+5 = 7
Step 2: Add fractions:

$$\frac{3}{7} + \frac{2}{7} = \frac{5}{7}$$

Example 2:
Simplify:

$$(x+y) + (y+z) + (z+x) - (x+y+z)$$

Step 1: Group smartly using common sums:

$$(x+y) + (y+z) + (z+x) - (x+y+z) = x + y + z$$

Sunyamanyat

Meaning:
"A fast way to subtract a number from 10, 100, 1000, etc."
Rule (Easy Way)

- Take each digit of the number:
  - **All digits except the last → subtract from 9**
  - **Last digit → subtract from 10**

Example 1:

- 9 − 3 = 6
- 9 − 5 = 4
- 10 − 6 = 4

✅ Answer: **644**

Example 2:

- 9 − 4 = 5
- 9 − 7 = 2
- 9 − 2 = 7
- 10 − 8 = 2

✅ Answer: **5272**

Sankalanavyavakalamnabyam

Meaning:
"Add and subtract the same number to make multiplication easier."
It's mainly used for numbers **close to a round number** like 50, 100, 1000.

Examples
Example 1:

- Take middle number 100
- 98 = 100 − 2, 102 = 100 + 2
- Multiply:

✅ Answer: **9996**

Example 2:

- Take middle number 50
- 47 = 50 − 3, 53 = 50 + 3
- Multiply:

✅ Answer: **2491**

Puranapuranabhyam

Meaning :
"If a number is near a power of 10 (like 10, 100, 1000), we can multiply numbers quickly using their differences from that power."
It's mainly used for **multiplication of numbers close to 10, 100, 1000, etc.**

Examples
Example 1:
Multiply
- Nearest 100 →
- Step 1: Subtract cross difference from 100: or
- Step 2: Multiply differences:
- Combine: **9500 + 6 = 9506**

✅ Answer: **9506**

Example 2:
Multiply
- Nearest 100 →
- Step 1: Add cross difference to 100: or
- Step 2: Multiply differences:
- Combine: **10700 + 12 = 10712**

✅ Answer: **10712**

Chalanakalanabhyam

Meaning :
"Chalana-Kalanabhyam" means 'move and calculate'.
It is used to **multiply or divide numbers quickly**.

Easy Idea
Do the sum **step by step** — move (chalan) and calculate (kalan).

Examples
Example 1:

→ Write as
→ Multiply:
=
✅ **Answer: 156**

Example 2:

→ Write as
→ Multiply:
=
✅ **Answer: 11024**

Yavadunam

In short:
👉 When numbers are **less than 10, 100, 1000**, we use **Yavadunam** to find the answer quickly.

⚙️ **Steps (Easy Way)**
1.Find how much the number is **less than** 10, 100, or 1000.
2.Subtract **crosswise**.
3.Multiply the deficiencies.

Example 1:
Step 1: Both are near 100.
→ 98 is **2 less**, 97 is **3 less**.
Step 2: Cross-subtract → (or)
Step 3: Multiply the deficiencies →
Step 4: Write together → **9506**
✅ **Answer = 9506**

Example 2:
Step 1: Both are near 100.
→ 96 is **4 less**, 94 is **6 less**.
Step 2: Cross-subtract →
Step 3: Multiply the deficiencies →
Step 4: Combine → **9024**
✅ **Answer = 9024**

Vyastisamastih

🌿 **Meaning**
"Vyasti–Samasti" means 'part and whole'.
It is used in **Vedic Mathematics** to solve problems by **breaking big numbers into smaller parts (Vyasti)** and then **adding them together (Samasti)**.
So, we split big numbers into easy parts → then combine to get the answer

Example 1:
Multiply
Step 1: Break into parts →

Step 2: Multiply each part:

(10×10) + (10×3) + (2×10) + (2×3)

✅ **Answer: 156**

Example 2:
Multiply
Step 1: Break into parts →

Step 2: Multiply each part:

(20×20) + (20×4) + (3×20) + (3×4)

✅ **Answer: 552**

Sesanyankena caramena

🌿 **Meaning**
"Sesanyankena Charamena" means "the remainders by the last digit."
It is used in **Vedic Mathematics for division** — to **find the remainder quickly** using the **last digit** (charamena)
👉 **"Sesa" = remainder**
👉 **"Anyankena" = by another number**
👉 **"Charamena" = by the last digit**
So, it helps to **find the remainder using the last digit of the divisor**.

Example 1:
Find the remainder when **347** is divided by **9**.
Step 1: Add all digits → 3 + 4 + 7 = 14
Step 2: Add digits of 14 → 1 + 4 = 5
✅ **Remainder = 5**
So, **347 ÷ 9 leaves remainder 5**.

Example 2:
Find the remainder when **256** is divided by **9**.
Step 1: Add all digits → 2 + 5 + 6 = 13
Step 2: Add digits of 13 → 1 + 3 = 4
✅ **Remainder = 4**
So, **256 ÷ 9 leaves remainder 4**.

Sopantyadvayamantyam

🌿 **Meaning**

"Sopantyadvayamantyam" means — last digit and twice the second last digit.

It is used to **check division or divisibility** of a number.

💡 **Easy Rule**

👉 Take the **last digit**

👉 Take **2 × (second last digit)**

👉 Add them to the rest of the number

If the result is **divisible**, then the number is divisible

Example 1:

Number = **253**, check by **19**

- Last digit = 3
- Second last = 5 → 2×5 = 10
- Remaining part = 2

Now add → 2 + 10 + 3 = **15**

15 is **not divisible by 19** → ❌ Not divisible

Example 2:

Number = **342**, check by **19**

- Last digit = 2
- Second last = 4 → 2×4 = 8
- Remaining part = 3

Now add → 3 + 8 + 2 = **13**

13 is **not divisible by 19** → ❌ Not divisible

Ekanyunena purvena

🌿 **Meaning :**

"Ekanyunena Pūrvena" means **"one less than the previous one."**
It is a **Vedic Maths sutra** used to **multiply numbers near powers of 10** (like 10, 100, 1000, etc.).

💡 **When to Use It**

Use this sutra when numbers end with **9s**, like 9, 99, 999, etc.

⚙️ **Rule (Easy Way)**

1.Take **one less than the previous number** (that's "Ekanyunena Purvena").
2.Write down the **complement (difference from 10, 100, etc.)** on the right side.

Example 1:

Find
Step 1: One less than 9 → **8**
Step 2: Complement of 9 (from 10) → **1**
Step 3: Write them together → **81**
✅ **Answer: 81**

Example 2:

Find
Step 1: One less than 99 → **98**
Step 2: Complement of 99 (from 100) → **01**
Step 3: Write them together → **9801**
✅ **Answer: 9801**

Gunitasamuccayah

🌿 **Meaning :**

“Gunitasamuccayah” means “the product remains the same.”
It is used in **algebra** and **multiplication** — it says that **the product of sums is equal to the sum of products**.
In short:
👉 If expressions are arranged differently, their **product stays the same**.

💡 **Simple Rule**
If
→ both sides give the **same product (Gunitasamuccayah)**.

Example 1:

```
(2 + 3)(4 + 5)
```

Left side:
Right side:
✅ **Product is same = 45**

Example 2:

```
(x + y)(a + b)
```

Left side:
Right side:
✅ **Both sides equal** — product doesn’t change.

Gunakasamuccayah

🌿 **Meaning :**

'Gunaka-Samuccayah" means 'sum of factors' or 'the sum of terms in a factor' can be used to simplify multiplication.'

It is used in **algebra and multiplication** to **expand or factor numbers quickly**.

In short:

Multiply each term in one bracket with each term in the other bracket.

💡 **Rule (Easy Way)**

(a + b)(c + d) = a×c + a×d + b×c + b×d

- Multiply **each term of the first bracket** with **each term of the second bracket**.
- Add all products.

Example 1:

(2 + 3)(4 + 5)

Step 1: Multiply each term:

2×4 + 2×5 + 3×4 + 3×5 = 8 + 10 + 12 + 15

✅ **Answer = 45**

Example 2:

(x + 2)(x + 3)

Step 1: Multiply each term:

x×x + x×3 + 2×x + 2×3 = x^2 + 3x + 2x + 6

✅ **Answer =**

Sub – sutra's

Anurupyena

🌸 **Meaning :**
“Anurupyena” means **proportionally** or **according to ratio**.
In Vedic Mathematics, this sutra is used **when numbers are not easily divisible**, and we use **proportion or scaling** to simplify the calculation.

✳️ **Example 1:**
Find
👉 This is easy,
But if we make it harder like ,
notice both numbers are **2 times** the earlier ones (48 and 16).
So the answer will also be **the same (3)**.
✅ **Answer = 3**
→ because proportionally (anurupyena) the ratio is same.

✳️ **Example 2:**
Find
We can see both numbers have a **ratio** of 150:50 = 3:1
So,
If we change the numbers to ,
→ both doubled, but the ratio remains same.
✅ **Answer = 3 again**

Sisyate Sesajnah

🌸 **Meaning of "Śiṣyate śeṣa-jñah"**
It means **"the remainder remains"** or **"know the remainder."**
In Vedic Mathematics, this sutra is used to **find remainders** when a number is **divided by another number.**

💡 **Easy Explanation**
When you divide one number by another, whatever is **left over** (not divisible) is called the **remainder**.
This sutra helps you quickly find that remainder.

✳️ **Example 1:**
Find the remainder when **23 is divided by 5**.
👉 5 × 4 = 20
👉 23 − 20 = **3**
✅ **Remainder = 3**

✳️ **Example 2:**
Find the remainder when **38 is divided by 7**.
👉 7 × 5 = 35
👉 38 − 35 = **3**
✅ **Remainder = 3**

AdyamadYenantyaMantyena

🌸 **Meaning :**
It means **"the first by the first and the last by the last."**
In Vedic Mathematics, this sutra is used when we **multiply or divide numbers having the same number of digits**
and we handle the **first (beginning) and last (ending) digits** separately.

💡 **Easy Explanation**
While multiplying two numbers:
•Multiply **first digits with first digits**, and
•Multiply **last digits with last digits**,
then **combine** the results properly.

✳️ **Example 1:**
Find
👉 First digits:
👉 Last digits:
Combine → **Answer = 384**
✅ **12 × 32 = 384**

✳️ **Example 2:**
Find
👉 First digits:
👉 Last digits:
Combine → **Answer = 989**
✅ **23 × 43 = 989**

Kevalaih Saptakam gunyat

🌸 **Meaning :**

It means **"multiply by 7 only (kevalaih = only, saptakam = seven)"**.
This sutra is used in **Vedic Mathematics** to simplify division by **7** or to find remainders when a number is divided by **7**.

💡 **Easy Explanation:**

When dividing a number by 7, multiply the **last digit** by **2**, add it to the **remaining part** of the number, and repeat if needed — this trick comes from this sutra.

✳️ **Example 1:**

Find remainder when **38 ÷ 7**

👉 Last digit = 8
👉 Multiply by 2 → 8 × 2 = 16
👉 Add to remaining number: 3 + 16 = 19
Now divide 19 by 7 → remainder = **5**
✅ **Remainder = 5**

✳️ **Example 2:**

Find remainder when **62 ÷ 7**

👉 Last digit = 2
👉 Multiply by 2 → 2 × 2 = 4
👉 Add to remaining number: 6 + 4 = 10
Now divide 10 by 7 → remainder = **3**
✅ **Remainder = 3**

Vestanam

Vestanam means **arranging numbers properly before doing calculation**.
It helps to solve sums easily and correctly.

🌸 **Example 1:**

23 × 4

→ Arrange properly and multiply:

23 × 4 = **92**

🌸 **Example 2:**

35 × 12

→ Arrange and multiply step by step:

35 × 12 = **420**

👉 **In short:** *Vestanam means keeping numbers in order to make calculation easy.*

Yavadunam tavadunam

👉 **Meaning:** "Whatever the deficiency, subtract that deficiency from the number and also square the deficiency."
It is mainly used for finding **squares of numbers that are near a base** like 10, 100, 1000, etc.

🌸 **Example 1:**
Find the square of **9**
Base = 10
Deficiency = 10 - 9 = 1
Now,
→ 9 − 1 = 8
→ 1^2 = 01
✅ **Answer = 81**

🌸 **Example 2:**
Find the square of **98**
Base = 100
Deficiency = 100 − 98 = 2
Now,
→ 98 − 2 = 96
→ 2^2 = 04
✅ **Answer = 9604**

Yavadunam tavadunikrtya varganca yojayet

👉 **Meaning:** "Whatever the deficiency, subtract the deficiency and add the square of the deficiency."
It is used to **find the square of numbers close to a base** (like 10, 100, 1000, etc.).

🧠 **Easy Explanation:**

If a number is **less than the base**, then:

1️⃣ Find how much less it is (deficiency).

2️⃣ Subtract that deficiency from the number.

3️⃣ Write the **square of the deficiency** on the right side.

🌸 **Example 1:**

Find the square of **9**

Base = 10

Deficiency = 10 − 9 = 1

Step 1: 9 − 1 = 8

Step 2: $1^2 = 01$

✅ **Answer = 81**

🌸 **Example 2:**

Find the square of **98**

Base = 100

Deficiency = 100 − 98 = 2

Step 1: 98 − 2 = 96

Step 2: $2^2 = 04$

✅ **Answer = 9604**

Antyayoradaskaepi

Meaning:

"Antyayor Dasake'pi" means **"when the last digits together make 10."**

This sutra is used for **multiplying two numbers** where:

- The **last digits (unit digits)** add up to **10**, and
- The **remaining digits (other parts)** are **the same**.

```
(AB)(CD) = (A)(A+1) | (B × D)
```

(Left part = number × next number)

(Right part = multiply unit digits)

🧮 **Example 1:**

- Last digits: 2 + 8 = **10** ✅
- First digits (4) are **same** ✅

Now,

- Left part: 4 × (4 + 1) = 4 × 5 = **20**
- Right part: 2 × 8 = **16**

So,

42 × 48 = 2016

🧮 **Example 2**

- Last digits: 3 + 7 = **10** ✅
- First digits (6) are **same** ✅

Now,

- Left part: 6 × (6 + 1) = 6 × 7 = **42**
- Right part: 3 × 7 = **21**

So,

63 × 67 = 4221

AntYayoreva

Meaning:
"Antyayoreva" means **"only the last digits"** or **"by the last terms only."**
This sutra is used when we have to find the **last digits** (or last part) of a product, or when **only the last terms ar** **important** for calculation.
It tells us that sometimes we can **ignore the rest** and **focus only on the last digits** to get the answer easily.

💡 **Use:**
When multiplying numbers and you only need to find the **last part** (like the last digit or last two digits), you can just multiply the **last digits** — that's **Antyayoreva**.

🧮 **Example 1:**
Find the **last digit** of
👉 Last digits: 7 and 3
→ Multiply them: 7 × 3 = **21**
So, the **last digit** of 47 × 53 is **1** (from 21).
✅ **Answer: 1**

🧮 **Example 2:**
Find the **last two digits** of
👉 Last two digits to consider: 8 and 2
→ Multiply them: 8 × 2 = **16**
So, the **last two digits** of 38 × 42 are **16**.
✅ **Answer: 16**

SamuccayagUnitha

💡 **Meaning:**

"Samuccaya-Gunita" means **"the product is multiplied by the sum (or common factor)."**

👉 In simple words:

When **the same total (sum or common term)** appears in both parts of an equation or expression, then that total (**samuccaya**) can be used as a **multiplier** to make the calculation easy.

🧮 **Example 1:**

Find the value of

$(x + 1)(x + 2)(x + 3)(x + 4)$

👉 Here, the common middle sum (samuccaya) = (1 + 4) = (2 + 3) = **5**

So the samuccaya is **5**

Now, we can pair like this:

(1×4) × (2×3) = 4 × 6 = **24**

Then multiply by the samuccaya (5):

24 × 5 = **120**

✅ **Answer = 120**

🧮 **Example 2:**

Find the value of

$(3 + 2)(3 + 4)$

👉 Common part is **3** (samuccaya).

= 3 × (3 + 2 + 4) = 3 × 9 = **27**

✅ **Answer = 27**

LopanasthaPanabhyam

Meaning:
It means **"By elimination and substitution."**
This sutra is used **to solve equations** (especially **simultaneous equations**) by **removing (lopana)** one va
and **substituting (sthapanam)** its value into another equation.
So, in simple words:
👉 **Remove one variable and put (substitute) its value into the other equa Ste**

🧮 **Example 1:**
Solve:
x + y = 10
x - y = 4
Step 1: Add both equations to remove **y**
(x + y) + (x − y) = 10 + 4
\Rightarrow 2x = 14
\Rightarrow x = 7
Step 2: Substitute into first equation
7 + y = 10 \Rightarrow y = 3
✅ **Answer:**

🧮 **Example 2:**
Solve:
2x + 3y = 12

Vilokanam

Meaning:

👉 *Vilokanam means solving a question by observing or noticing patterns quickly.*

Example 1:
Find the square of 25
Observation (Vilokanam):
25 = (20 + 5)
We can notice that:

$$25^2 = (20 + 5)^2 = 20^2 + 2(20×5) + 5^2$$

= 400 + 200 + 25 = 625 □
Here we got the answer **just by observing** the pattern of $(a + b)^2$.

Example 2:
Find 101 × 99
Observation (Vilokanam):
We can see that both numbers are close to 100.
So,
101 × 99 = (100 + 1)(100 - 1)
Using the pattern $(a + b)(a - b) = a^2 - b^2$,

$$= 100^2 - 1^2 = 10000 - 1 = 9999$$

Again, by **observation**, we got the answer easily.

Gunitasamuccayah Samuccayagunitah

□ **Meaning in simple words:**
"The product of the sums is equal to the sum of the products."
👉 It means —
If two or more quantities are in proportion,
then **the product of the first and last is equal to the product of the middle terms.**

Example 1:
\frac{2}{4} = \frac{3}{6}
Check:
2 × 6 = 12
4 × 3 = 12
✅ Both equal — Rule is true.

Example 2:

\frac{5}{10} = \frac{7}{14}
Check:
5 × 14 = 70
10 × 7 = 70
✅ Both equal — Rule is true.

Thank you for your attention 🙏😊