VEDIC MATHEMATICS

Rapid Mental Calculation for Juniors, Keen Teens and Adults

WORKBOOK

Jain 108

The Joy of Numbers Institute

Miniversity

MatheMagics For StarKidz

SACRED GEOMETRY

AFTER SCHOOL CLASSES

MULLUMBIMBY OCTOBER 2014

LEARN SACRED GEOMETRY WITH JAIN 108. + MATHEMAGICS CLASSES
For CHILDREN & ADULTS Of ALL AGES

JAIN 108's **21st CENTURY CURRICULUM** invites You and Your Child to:

- Learn how to multiply numbers at the Speed of Thought.
- Become a Mathematical Genius.
- Improve your Mathematical Confidence.
- Improve your Memory Power.
- Build the Mental Muscle!
- Learn about Magic Squares, the Fibonacci Sequence, Fractal Geometry and the 5 Platonic Solids.
- Translate Numbers Into Art.
- This New Maths is the emerging curriculum for the Earthheart School or Sacred Geometry University.
- Certificate Accredited Courses issued per School Term.

Link: **http://www.jainmathemagics.com/page/11/default.asp**

2014 Classes after school include:

Mathemagics For StarKids (5 to 8 years old)
Starts Tuesday 7th October, 2014 Time 3.20pm to 4.30pm.
4 Tuesdays in October. One Parent to be present.

Mathemagics For Juniors (9 to 12 years old)
Starts Wednesday 8th October, 2014. Time 3.20pm to 4.30pm.
4 Wednesdays in October. One Parent to be present.

Mathemagics For Teens (13 to 19 years old)
Starts Thursday 9th October, 2014. Time 3.20pm to 4.30pm.
4 Thursdays in October. Adults are welcome as paid students in this class.

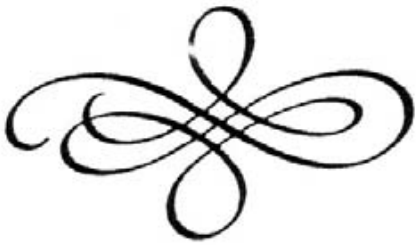
Bookings are essential. $20 per class.
A commitment to these 4 classes involves a payment of $80 before the 1st October.

All enquiries for Term 4, 2014, call Jain 108 on 02 6684 4409 or 0423 583 886

VENUE: AT **THE LIVING YOGA SANGA**
(first floor, 63 Stuart Street. above Mullum Mac in Mullumbimby 2482, Far North N.S.W, inland of Byron Bay)

CONTENTS

CONTENTS Continued...



From the series:
"JAIN 108 MATHEMAGICS CURRICULUM FOR THE GLOBAL SCHOOL"

By JAIN 108
(writer, artist and Mathematical Futurist)

2015

Produced by JAIN F.R.E.E.D.O.M.S
(For Research Expressing Essential Data Of Magic Squares)

www.jainmathemagics.com

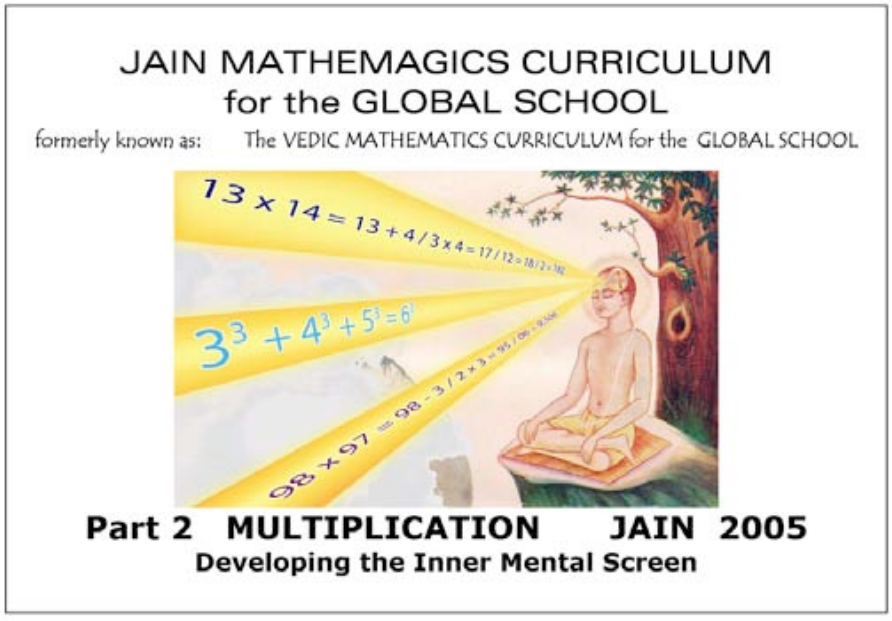
adapted from:
MATHEMAGICS for TEENAGERS 2006

CERTIFIED CERTIFICATE COURSE
Accredited for Wednesday Afternoons (or 1 School Term) from 3.30pm to 5pm

CURRICULUM NOTES
Presented as Worksheets as a companion Manual for the 5 DVD Set

This COURSE REPEATS EACH SEASON or TERM
in any village, school, institution or country of the world.
and is being prepared as a digital Online Course

This booklet is also a GUIDELINE or **MANUAL for TEACHER TRAINING SEMINARS**



INTRODUCTION

- **Registration** Date ……..…….

- **Venue**: At ……..……..

- **Name Introductions** by throwing ball around, if time permits: stating :

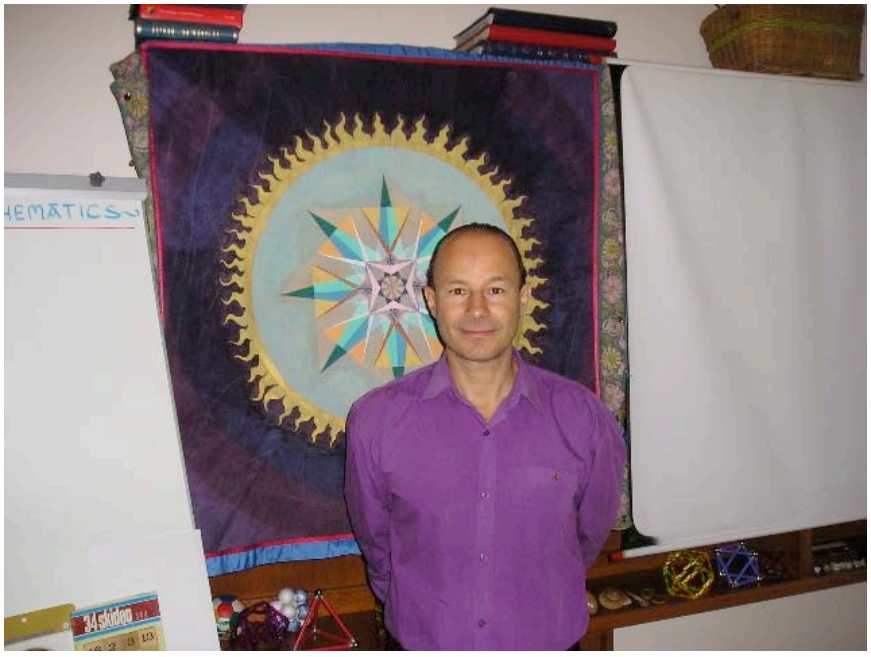
My name is ……..…… and my favourite fruit is …….…….

This also teaches Memory Power by using an association with an Image.
eg, the 4th Person in the circle of say 10 students, would say, reciting from memory the favourite fruit of the 4th, then the 3rd, then the 2nd, would say:
Lou loves mangoes, Amala loves strawberries, Marcus loves passionfruit, my name is Germaine and I love pawpaw.

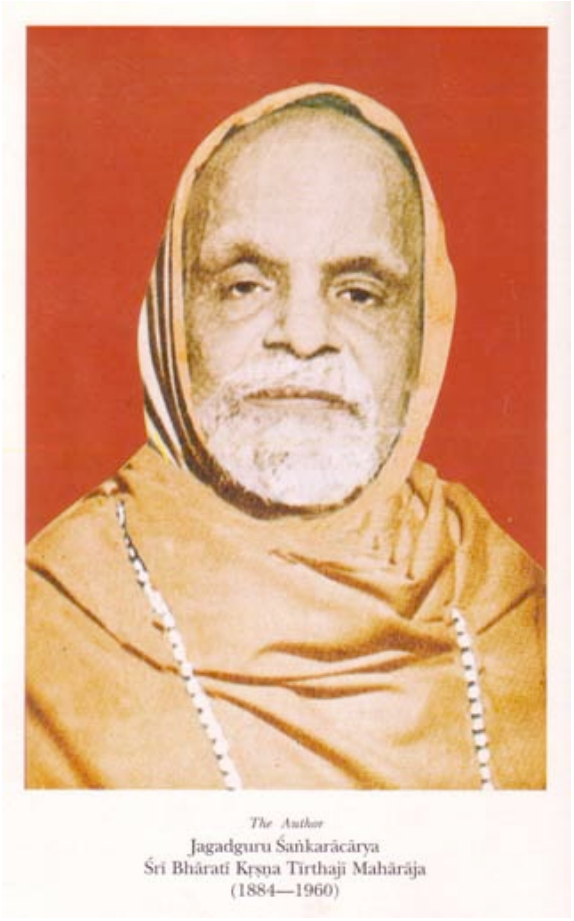
Also have **NAME CARDS** written in calligraphy in front of each student, to assist both the teacher and students to learn one another's names.

- **Introduction** to Vedic Mathematics and Pattern Recognition

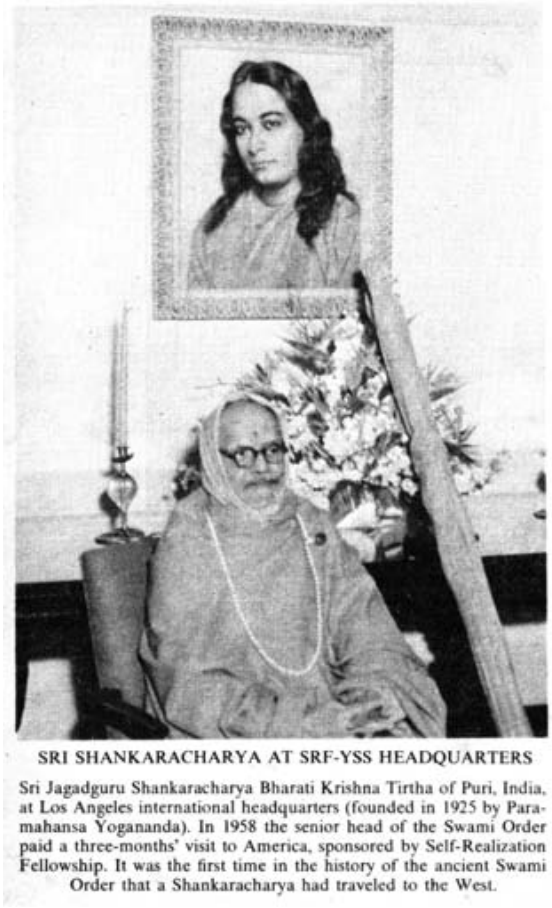
- **Revision** of the Days work.
  Kumon = Japanese concept of revising material within 24 hours to lock the information in your brain for life.



Jain: International Lecturer on Vedic Mathematics and Sacred Geometry)



The Author
Jagadguru Śaṅkarācārya
Śrī Bhāratī Kṛṣṇa Tīrthajī Mahārāja
(1884—1960)

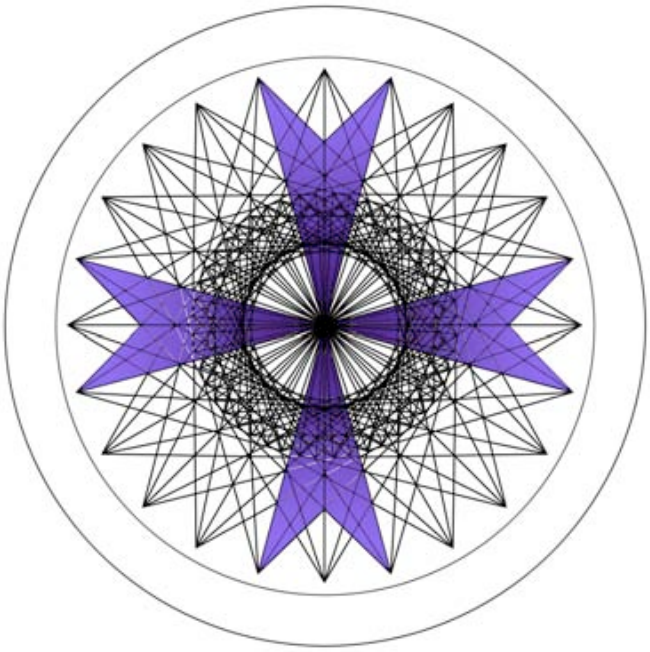


SRI SHANKARACHARYA AT SRF-YSS HEADQUARTERS

Sri Jagadguru Shankaracharya Bharati Krishna Tirtha of Puri, India, at Los Angeles international headquarters (founded in 1925 by Paramahansa Yogananda). In 1958 the senior head of the Swami Order paid a three-months' visit to America, sponsored by Self-Realization Fellowship. It was the first time in the history of the ancient Swami Order that a Shankaracharya had traveled to the West.

Bharati Krsna Tirthaji (1884 – 1960): A Pope or Shankacharaya of India.

+ (extract from "Autobiography of a Yogi" by Yogananda Paramahansa)



(A Wheel of 24 design by Jain
- derived from the Multiplication Table digitally compressed and
- highlighting the Prime Number Cross)

Biographical History Surrrounding Bharati Krsna Tirthaji's life:

- **1884** - born to highly learned and pious parents and known as Venkatraman.
- Was dux of every school he attended in teenage years eg: at Madras University and excelled with highest honours in 8 subjects: Sanskrit, Philosophy, English, Science, History, Mathematics.
- His mentor was Bhartrhari – a philosopher of grammar.
- Gave many demonstrations of Vedic Maths in many universities in India (and later in USA).
- **1908** – A burning desire for spiritual knowledge, begins a monastic life but was swayed to do 3 years as a principal of a college.
- **1911** – returns back to a monastic life for 6 years in deep study of Vedanta, Brahma-Sadhana and vigorous practices in a nearby forest in Sringeri, leaving only sometimes to teach at Poona, on request.
- **1919** - Initiated in the highest order of Samnyasa at Varanasi (Benares) by his guru, and changed his name to Bharati Krisna Tirtha, age 35
- As an acclaimed authority on Sthapathyaveda (the mathematics of Engineering and Temple Building) he tours India and took the entire intellectual and religious class of the nation by storm, spreading Sanatana Dharma which promotes Vedic concepts of world peace. His guru has failing health and insists the Swami be Head of this Organization.
- **1956** – Confirmed loss of 16 volumes of Vedic Mathematics, that he wrote on the 16 Sutras, and were stored at a disciple's house. Some Indians copying this Rapid Mental Calculation had already dazzled audiences, claiming occult powers without acknowledgement to the master's teachings, therefore his closest friends insist him to arrange publication of the 16 sutras in his own name (but the one book, a mere introduction of 400 pages, that he writes in 1957 gets published 7 years posthumously).
- **1957** – He easily writes via dictation the only one surviving book, having an astute memory but failing eyesight. (This book is to become the bible on Mathematics in the western world 50 years posthumously).
- **1958** – Tours America. This is a historical moment, as it is the first time that a Shankaracharya of this High Order left India (known really as "Bharat") to go abroad.
  (Usually there are brahmanic rules that state that a holy man is never allowed "to cross the waters" etc, but he believed that to raise planetary consciousness it was important to defy the scriptures and release the 16 sutras or threads of knowledge that had been lost. Unfortunately this knowledge gets buried by the American intellectual Gestapo who do not give these mathematical gems to their culture, but bury it for many decades until people like Mr Kenneth Williams of England and Jain of Australia empower their students with the revival of this material. NASA use it secretly in the field of Artificial Intelligence, in the sense of how does a robot's brain works with mathematical calculations).
- **1958** – was sponsored by the Self Realization Fellowship in Los Angeles, the Vedantic Society founded by Paramahansa Yoganandaji who died in 1952, and succeeded by Mata. Bharati Krsna spends 3 months lecturing in universities, radios, and also made some television appearances. His profound knowledge of Mental, One-Line Arithmetic takes the intellectual world by storm.
  (American officials who witnessed these lectures realizes that if every child learnt this system, they would have a whole race of geniuses, and this can not be allowed in any plutocracy. As the years go by, it is obvious that there is no available record of all the film transcripts of this most important visit, and it is suspected that the Vatican stole this archival footage, as well as the original16 hand written volumes of books that went missing years prior to this tour).
  (Indian publishers offer a huge reward for the retrieval of these books and film footage in the year 2004 and set up a society to reclaim their lost heritage, and to relinquish the centuries of British control of the Indian Mathematical Curriculum).
- Over-worked and ill-health sets in.
- **1960** – Leaves his body.

VEDIC MATHEMATICS SUTRAS

1	एकाधिकेन पूर्वेन Ekādhikena Pūrvena	*By One More than the One Before*
2	निखिलं नवतश्चरमं दशतः Nikhilam Navatascaramam Dasatah	*All from 9 and the Last from 10*
3	उर्ध्वतिर्यग्भ्यामं Ūrdhva Tiryagbhyām	*Vertically and Cross-wise*
4	परावर्त्य योजयेत् Parāvartya Yojayet	*Transpose and Apply*
5	शून्यं साम्यसमुच्चये Sūnyam Sāmyasamuccaye	*If the Samuccaya is the Same it is Zero*
6	आनुरूप्ये शून्यं अन्यत् (Ānurūpye) Sūnyamanyat	*If One is in Ratio the Other is Zero*
7	संकलन व्यवकलनाभ्यां Sankalana Vyavakalanābhyām	*By Addition and by Subtraction*
8	पूरणापूरणाभ्यां Pūranāpūranābhyām	*By the Completion or Non-Completion*
9	चलनकलनाभ्याम् Calana Kalanābhyām	*Differential Calculus*
10	यावदूनं Yāvadūnam	*By the Deficiency*
11	व्यष्टिसमष्टिः Vyastisamastih	*Specific and General*
12	शेषाण्यङ्केन चरमेण Sesānyankena Caramena	*The Remainders by the Last Digit*
13	सोपान्त्यद्वयमन्त्यं Sopāntyadvayamantyam	*The Ultimate and Twice the Penultimate*
14	एकन्यूनेन पूर्वन Ekanyunena Purvena	*By One Less than the One Before*
15	गुणितसमुच्चयः Gunitasamuccayah	*The Product of the Sum*
16	गुणकसमुच्चयः Gunakasamuccayah	*All the Multipliers*

nb: Every time you have completed an exercise and therefore learnt the meaning of a new sutra, you will mark it on next page, with a tick or a symbol or a colour or any mark that shows you understand it.

The 11 sutras, shaded below are the ones that will be dealt with in this booklet.

16 SUTRAS	14 SUB-SUTRAS
1 - By One More Than the One Before eg: $35^2 = 3x4/5^2 = 12/25 = 1,225$	1 - Proportionately
2 - All from 9 and the Last from 10 eg: 1000 – 712 = 288	**2 - The Remainder Remains Constant** eg: $19x19 = (19-1)x2/1^2 = 36/1$
3 - Vertically and Crosswise eg: 21x78	3 - The First by the First and the Last by the Last
4 - Transpose and Apply eg: 36x50 = (36x100) ÷2 = 1800	4 - For 7 the Multiplicand is 143
5 - If the Samuccaya is the Same it is Zero	5 - By Osculation
6 - If One is in Ratio the Other is Zero	**6 - Lessen by the Deficiency** eg: $98^2 = 98-2/2^2 = 96/04 = 9,604$
7 - By Addition and by Subtraction	**7 - Whatever the Deficiency lessen by that amount and set up the Square of the Deficiency.** eg: $98^2 = 98-2/2^2 = 96/04 = 9,604$
8 - By the Completion or Non-Completion eg: 39+25 = (39+1)+(25-1) = 40+24 = 64	8 - Last Totalling 10
9 - Differential Calculus	9 - Only the Last Terms
10 - By the Deficiency eg: $19x19 = (19-1)x2/1^2 = 36/1$	**10 - The Sum of the Products** aka **Digit Sums** or **Digital Compression** eg: 11x34 = 3/3+4/4 = 374
11 - Specific and General	11 - By Alternative Elimination and Retention
12 - The Remainders by the Last Digit	**12 - By Mere Observation**
13 - The Ultimate and Twice the Penultimate	13 - The Product of the Sum is the Sum of the Products
14 - By One Less than the One Before	**14 - On the Flag** eg: 12x13 = raise the 2 & raise the 3
15 - The Product of the Sum	
16 - All the Multipliers	

17 – (Jain's additional Sutra: not mentioned in the Vedas)
Trachtenberg's Method for 1 Digit x 2 Digit eg: 3x48 = 12/24 = 14/4 = 144

This content is repeated during Term 2 of 2015, but also new content for Term 2 will be offered, an exciting 8 week / 8 Lesson course on the 5 Platonic Solids.

Mathemagics For Juniors Code Name = **M4J**

INTRODUCTION

These following Lesson Plans are the script to make a video to fulfill a need for a new curriculum for Star Kids, aged 5 to 8 years old, for the international Home Schooling Movement. It essentially is a guide for Parents to introduce their child to the basic geometric concepts that is suitable for this age group.
This booklet will be followed by another book and video called Mathemagics 4 Juniors (ages 9 to 12 year olds), Code Name = M4J.
This in turn will be followed by another book and video called Mathemagics 4 Teens (ages 13 to 19 year olds), Code Name = M4T.

Any contributions to the improvement of this material is welcomed.

The putting together of this rare and original syllabus has been a fantastic challenge for me, being forced to write content for the youngest level of the enquiring mind, asking myself, how is it that an innocent Child truly learns. Usually I am cracking cryptic codes and working on high level algebraic equations, so this simple and evolving Miniversity has kept the target real and focussed .
The element of Discovery is an important component of this course. I realized over the years that this is a natural aspect of learning, not just an intellectual endeavour.
Unique to this Jain Mathemagics course is the inclusion of a parent with every child. This suggests that when a parent and child go on a long car journey, they could be practicing together all the new sutras that they had learnt. This creates a sense of a caring involvement with the sensitive Parent and Child relationship.
And ultimately, the final test, is the practical one, to walk into a supermarket and work out mentally the change from $10 for say 9 apples at 39 cents each, before the girl at the electronic cash-register prints out the cost and the change, and you confidently already know it.

Produced and Printed in Mullumbimby Creek, Far North NSW, 2482, Australia.

♡ **Jain 108 Mathemagics** ♡

REVISION

At the beginning of every Lesson, after Lesson 1, beginning Lesson 2, do some **revision**, spending about 10 to 15 minutes, very quickly, but going over the answers so that the children understand the past lessons. This helps to retain the vast amount of new information that they will be acquiring.
Here are some sample Revision questions:

Lesson 1:
a. 9 x 3 (Back of the Hands)
b. 9 x 49 (Using "V"-shape)
c. 8 x 7 (Using Magic Fingers and using sutra: "By The Deficiency")
d. 12 x 14 (Magic Teens or Moroccan Arabic Method where you Curl the Fingers)

Lesson 2:
d. 11 x 14 (Using Sutra: "Digit Sums" No carry-over)
e. 11 x 58 ((Using Sutra: "Digit Sums" with a carry-over)
f. 11 x 58 (Using New or Alternative Method)
g. 11 x 3,456 (for more than 2 digits)

Lesson 3:
i. 1,000,000 – 691,877 (Using Sutra: "All From 9 & The Last From 10")
j. $10.00 – 9 x 49c (Practical Super-Market Example)

Lesson 4:
k. 12 x 14 (Using Sutra: "By The Excess" No Carry-Over)
l. 14 x 16 (Using Sutra: "By The Excess" Carry-Over)
m. 17^2 (ibid, squaring teen numbers)

Lesson 5:
n. 3 x 46 (Trachtenberg Method, with a Carry-Over)
o. 9 x 71 (Trachtenberg Method, with no Carry-Over)
p. 7^3 (Trachtenberg Method, for Cubing Numbers)

Lesson 6:
q. 54^2 (Squaring of the Numbers from 50 to 60)
r. 98 x 97 (Using sutra: "By The Deficiency")
s. 96^2 (ibid, Squaring of the Numbers in the 90s)
t. 108 x 109 (Using sutra: "By The Excess")
u. 1,011 x 1,023 (Using 2 sutras, one is Digit Sums to x11)

Lesson 7:
w. 33 x 37 (Using sutra: "By One More" ie: Cognate Numbers)
x. 65^2 (Using sutra: "By One More", The Squaring of Numbers Ending in 5)

Lesson 8:
y. 3 4 x
8 2 (Using sutra: "Vertically & Crosswise")
z. 34 x 82 (Using Arabic sutra: "Gelosia")

Lesson 9:
z_1 Demonstrate in front of the class, the puzzle: "Predicting The Future Answer"

nb: At the end of every Lesson or Chapter,
there is a blank page for notes or space to write on.

LESSON 1

MAGIC FINGERS
Finger Computation
Handy Maths

Synopsis or Summary of the Lesson

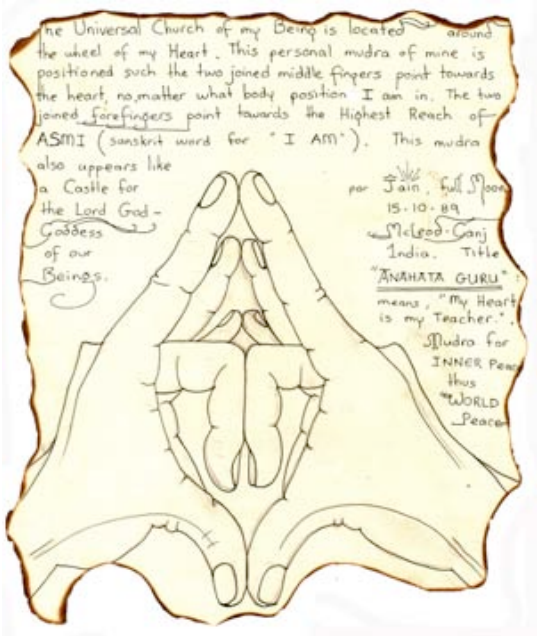
1 – Multiplication of a Single-Digit by Nine eg: 4x9.
Using Back Of The Hands + Bent Finger.

2 – Multiplication of a 2-Digit by Nine eg: 38x9. Using "V-Shape" + Bent Finger.

3 – Universal Times Table or "Magic Fingers" solving 6x, 7x, 8x, 9x
Facing the Palms Of The Hands.

4 – Magic Teens solving 11x, 12x, 13x, 14x, 15x
Ancient Moroccan Method, curling fingers in.

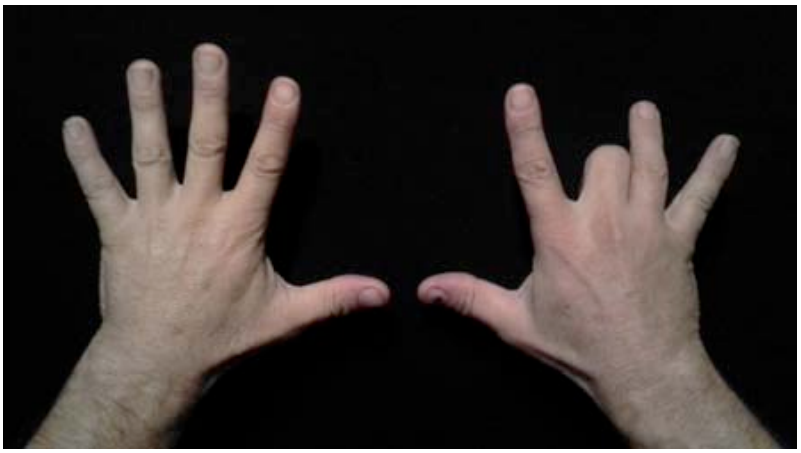
5 – Algorist Versus the Abacist: ie: Indian Vedic Maths Versus Chinese Abacus!
sample from my **Facebook Business Page**: **Jain 108 Mathemagics**.



(Art by Jain, 1989)

9 x TABLE USING "BACK OF THE HANDS". MULTIPLYING SINGLE DIGITS BY NINE USING FINGERS ONLY

Children will find it of great interest to learn that they can compute their Times Table, like multiplying by 9, merely by glancing at their fingers!
Have your arms extended out so that you are viewing the back of your hands, with your ten fingers fanned out in front of you.
Focus now on your left hand, and starting from your left baby finger, give it a value of "1" and moving across to the left thumb, give each successive finger a value of increasing order. Other words for this are sequentially, or in consecutive order, or in natural counting order ie: ring finger = "2", middle finger = "3", index finger = "4", thumb = "5".
Focus now on your right hand, and starting from your right thumb, give it a value of "6", and moving across to the left thumb, give each successive finger a value of increasing order, ie: index finger = "7", middle finger = "8", ring finger = "9", and the thumb = "10". It's as if you are looking at the fingernails and each nail has those numbers written on them in texta color.



EXAMPLE 9 x 8

Starting from Left to Right,
Bend the 8th Finger.

To multiply 8 x 9, all you need to do is to count to your 8th finger, starting from the far left and bend it down to almost touch the palm of that hand. Then from either side of the bent finger, read the answer which is revealed as two groups of fingers:
The seven fingers on the left hand side of the bend represent the Tens Column, thus equals 70, and the 2 fingers on the right hand side represent the Units Column, thus equals 2. Combined, the instant answer is 70 + 2 = 72.

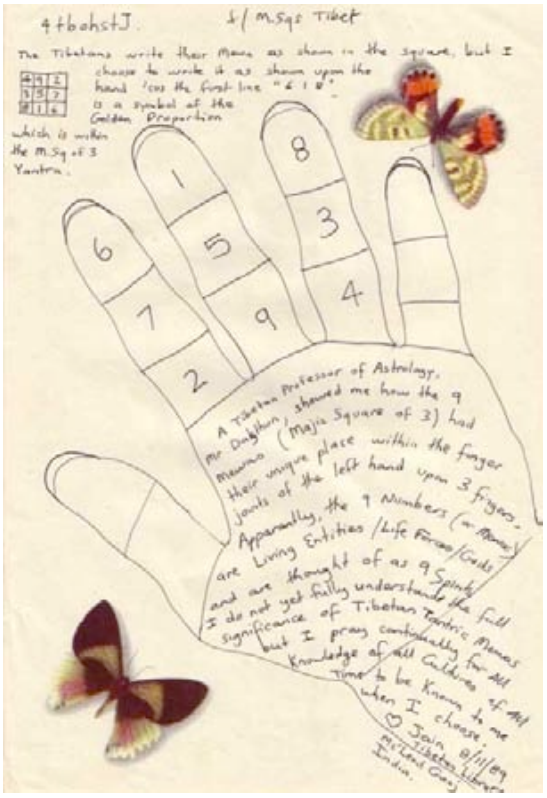
EXERCISE 1A

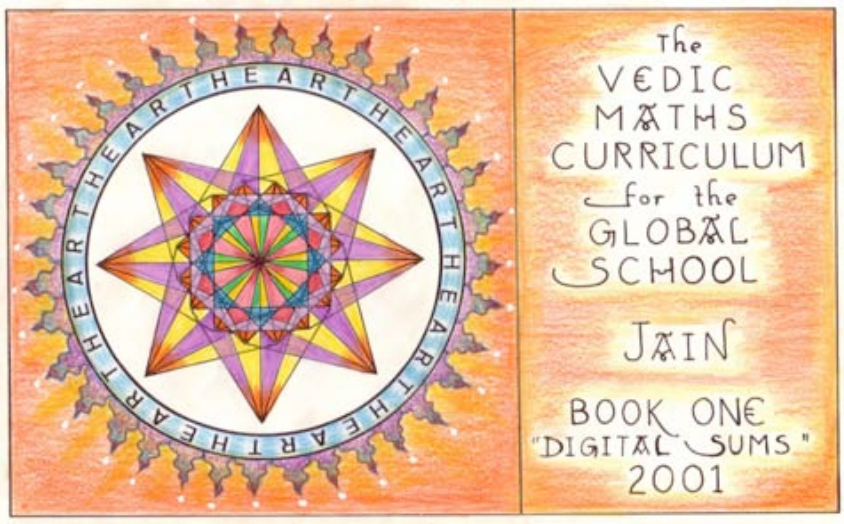
Calculate, using your fingers, the multiplication of:

a) 7 x 9 = **b)** 4 x 9 = **c)** 3 x 9 =

d) 2 x 9 = **e)** 6 x 9 = **f)** 5 x 9 =

g) 9 x 9 =

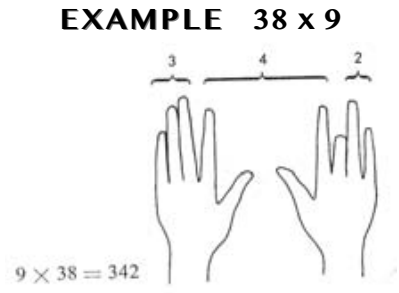




Answers 1A:

a) 63, b) 36, c) 27, d) 18, e) 54, f) 45, g) 81

9 x 2 DIGIT-NUMBERS
USING "V-Shape + BACK OF THE HANDS".



To compute 38 x 9, have your arms and fingers extended out and locate the third finger from the left hand side. This is your left middle finger. This time, rather than bending that finger, make a space between this and the fourth finger, like a "V-shape" as shown above.
Regarding the "8" of the "38", focus now on the eighth finger which is the middle finger of your right hand and bend this one down. Voila! You now have your instant answer before your eyes. You will observe that there are 3 compartments or groupings of your fingers formed by the "V-shape" and the bent finger. Beginning from the left hand side, call out these groupings:
3 / 4 / 2, giving an answer of 342.
nb1: We can only multiply by 9, like 9x38, when the first digit "3" is less than the second digit "8".
nb2: We can not multiply a Double Digit by 9 like 9x88 or 9x66 easily. There are ways to do this on your hands, but not for this lesson.

EXERCISE 1B

Calculate, using your fingers, the multiplication of:

a) 9 x 47 = **b)** 9 x 39 = **c)** 9 x 26 =

d) 9 x 17 = **e)** 9 x 56 = **f)** 9 x 46 =

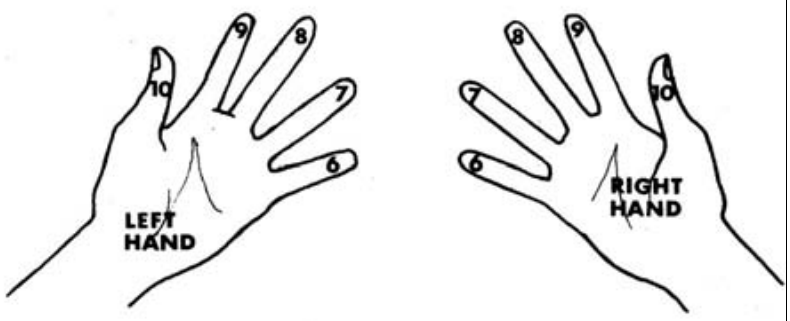
Answers 1B:

a) 423, b) 351, c) 234, d) 153, e) 504, f) 414

There are 3 anomalies or unusual features in this exercise:
nb1: There is a fault in this system. There is one condition where it fails. Can you find this anomaly? Here are 3 clues: 9 x 64, 9 x 83, 9 x 72.
It can only work out correctly when the Units Column is larger than the Tens Column eg: 9 x 37 can be solved, as 3 is less than 7, but not 9 x 73 as 7 is greater than the 3.
The mathematical symbols for "lesser than" is " < " and the symbol for "greater than" is " > ". To rewrite the above: eg: 9 x 37 can be solved, as 3 < 7, but not 9 x 73 as 7 > 3.
nb2: for e) 9x56, did you notice that a zero appears in the tens column or middle digit? because there is no space between the "V" after the "5" and the "Bent Finger" for "6".
nb3: for a double digit like 9x88 the whole system breaks down for what we call "9 Times a Rep Digit" Rep means "Repeating" Digit like 33 or 44 or 55 or 66 etc… This can be solved by using an upcoming vedic sutra in Lesson 3 that uses Complements of 10 and a sub-sutra: "By One Less".

MAGIC FINGERS
Looking at the Palms of your Hands
or HANDY MATHS

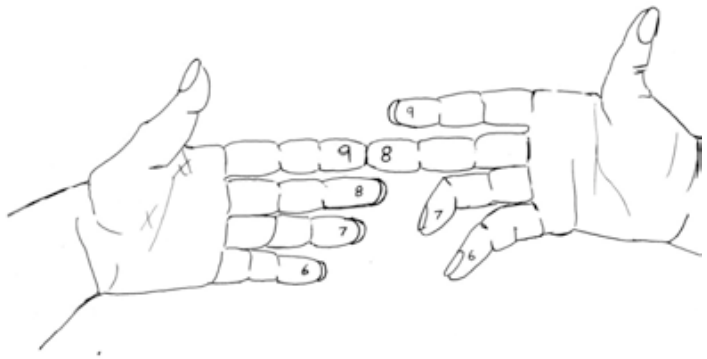
UNIVERSAL TIMES TABLE SOLVING 6X, 7X, 8X 9X



The UNIVERSAL TIMES TABLE

Achieved by using the fingers on each hand that represent the numbers from 6 to 10

There is a special technique for knowing your Times Table, quickly, by mere use of finger dexterity. It use to appear in old mathematical text books and unfortunately became obsolete, but here it is revived to do it the justice it deserves.
The rediscovery of this diagram, published in my early books took me around the world for 3 years, as a guest speaker, from India to USA.
Mark the fingers of both hands, in texta color, or imagine they are written upon them, with the numbers 6, 7, 8, 9, and 10 beginning with the baby finger as
No. 6, the ring finger as No. 7 etc till you get to the thumb as No. 10. Refer to the diagram below:



Art by Jain

Multiplying
9 x 8
Using Fingers Only.

LEARN 2 YEARS OF ROTE LEARNING LABORIOUS TIMES TABLES IN 15 MINUTES!
AMAZING.
A very tactile method for multiplying numbers.

Suppose you require to know what 9 x 8 is? .
Locate on your Left Hand the finger representing 9, which is the index finger, and locate on your Right Hand the finger representing 8, which is the middle finger. With palms facing you, join those 2 fingertips to touch and allocate to each of the joined fingers, plus the 5 fingers below them, a value of 10 units. All together there are 7 lots of 10. Say: "Everything that is joined and below is worth 10 points".
This gives a value of 70. Add to this, the multiplication of the remaining fingers. Observe that there is 1 finger on the Left Hand that is above the joined fingers, and there are 2 fingers surplus or remaining on the Right Hand. Multiplying these 2 excesses or remainders is 1 x 2 = 2. The final answer is therefore 70 + 2 = 72.
Children adore this method, as they no longer need to rote learn their 6 Times, 7 Times, 8 Times and 9 Times Tables, the ones that they often have difficulty with. It gives them a connection with numbers that is tactile, tangible, simple. There is a sense of achievement and wonder from the nimble and dexterous activity happening in front of their eyes.
Highly recommended to learn, so practice with these following examples:

EXERCISE 1C

Use your fingers to multiply the following Single Digits X Single Digits (1D x 1D).

a) 8 x 9 =

b) 7 x 7 =

c) 7 x 9 =

d) 8 x 8 =

e) 6 x 7 =

f) 6 x 9 =

g) 6 x 8 =

h) 6 x 6 =

i) 9 x 9 =

j) 8 x 7 =

Answers 1C:

a) 72, b) 49, c) 63, d) 64, e) 42, f) 54, g) 48, h) 36, i) 81, j) 56

MAGIC TEENS
FINGER COMPUTATION for MULTIPLICATION
OF 11x, 12x, 13x, 14x, 15x "by Curling Fingers"

Here is another unique and impressive method for multiplying any of these following 4 numbers: 11, 12, 13, 14 & 15 from ancient Moroccan sources.
ie: we can multiply say 11x14 or 12x13 or 13x14 etc by using the Sutra: "By The Excess", evaluating how much is the excess of these numbers above the Base 10. eg: 11 = 10+1 therefore has an excess of 1. We merely add these combined excesses on both hands, then times the 2 excesses, then just add 100 to get the final answer!

Magic Teens (Arabic Moroccan Method) for Multiplying **11x, 12x, 13x, 14x, 15x**

Above is how we multiply 12 x13.

The Number 12 is represented by the Left Hand with 2 curled fingers for 10+2.

The Number 13 is represented by the Right Hand with 3 curled fingers for 10+3.

Each curled finger is worth 10 points. Add the sum of all curled fingers =2+3 = 5 and thus it is valued at 5x10 = 50 points. Now multiply these 2 excesses = 2x3 = 6. Add this to 50 giving us 56. Now add 100 to this = 100 + 56 = 156, the final answer!

Above is how we multiply 13 x14. (This involves the use of a Carry-Over).

The Number 13 is represented by the Left Hand with 3 curled fingers for 10+3.

The Number 14 is represented by the Right Hand with 4 curled fingers for 10+4.

Each curled finger is worth 10 points. Add the sum of all curled fingers =3+4 = 7 and thus it is valued at 7x10 = 70 points. Now multiply these 2 excesses = 3x4 = 12. Add this to 70 giving us 70+12=82. Now add 100 to this = 100 + 82 = 182, the final answer!

EXERCISE 1D
Multiply the following Magic Teens

a) - 11 x 11 =

b) - 11 x 15 =

c) - 11 x 13 =

d) - 11 x 14 =

e) - 12 x 12 =

f) - 12 x 13 =

g) - 12 x 14 =

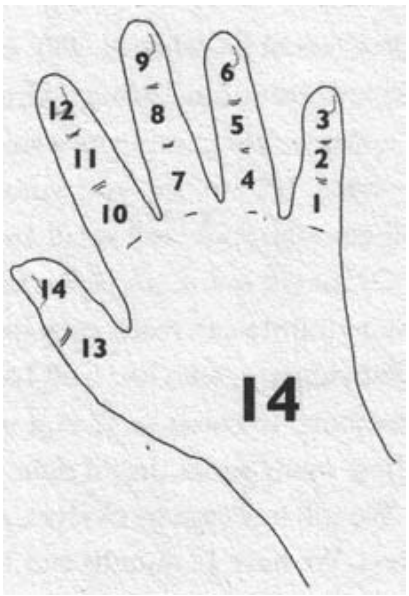
h) - 13 x 13 =

i) - 13 x 14 =

j) - 14 x 15 =

nb: when expressing "15" the excess of "5" is 5 curled fingers or a fist!

South American Method of Counting up to 20 using both hands and feet



Method of Counting up to 14

(both images sourced from:

"The Universal History of Mathematics" by Georges Ifrah)

Answers 1D:

a) 121, b) 165, c) 143, d) 154, e) 144, f) 156, g) 168, h) 169, i) 182, j) 210

"Goddess Of Arithmetic Stands By the Algorist Versus the Abacist":

Arithmetic, the ancient Science of Numbers, is symbolized by the Woman standing in the centre. It appears that she is deciding the debate or quarrel between the Abacist and the Algorist. The Abacist would be an Ambassador from the East, like China, or possibly symbolic of the Roman Numeralist who also used a clumsy use of beads to calculate their merchandise.

The Algorist would be an Ambassador from India, performing Rapid Mental, One-Line Arithmetic with his secret use of the Zero and the Decimal Place System.

It appears that this Goddess of Numbers favours the Vedic Mathematician or Algorist as she is seen facing this clever reckoner using Hindu-Arabic numerals. She also has the same numerals adorned on her garment as seen on the reckoner's table.

Interestingly, today, the same debate goes on in the world of the Math Olympiads where the greatest minds in bead-based Abacus are challenging the greatest minds in Vedic Mathematics (Rapid Mental Calculation).

The **abacus** (**plural** abaci or abacuses), also called a counting frame, is a calculating tool that was in use centuries before the adoption of the written modern numeral system and is still widely used by merchants, traders and clerks in Asia, Africa, and elsewhere.

Interestingly, and in conclusion, the dilemma that faced the medieval merchants when valuing the exchange of their merchandise, is the same dilemma that faces our contemporary mathematicians: this nagging question: "Do we choose to calculate our sums mentally or with one-line arithmetic, like the adept Algorist, or do we choose the easier path and give our power to the machine: the electronic calculator that does it all for us, at the price of atrophying the human brain over the next 20 years or upcoming generation?"

Jain 108

1- (This rare woodcut is from the "Magarita Philosophica: by Gregorius Reich [Freiburg, 1503], currently housed in the Museum of the History of Science, Oxford).

2- (Thanks also goes to the Moroccan scholar Georges Ifrah who wrote an encyclopedia on the History of Numbers, called "From One To Zero" from which this woodcut was sourced).

3- This article first appeared on my Facebook Business Page: Jain 108 Mathemagics. This site has lots of Sacred Geometry descriptions for your higher learning.

LESSON 2

MULTIPLICATION By 11 Sutra: "Digit Sums"
+
VEDIC ADDITION Sutra: "By The Completion"

Lesson 2
Synopsis or Summary of the Lesson

1 – 11 x 2-Digit Numbers Whose Digit Sum is Less than or Equal to 9

2 – Splitting the Digits and Adding Their Sum

3 – 11 x 2-Digit Numbers Whose Digit Sum is Greater Than 9

4 – "New Method": Adding The First Digit to the 2 Digit Number, the Last Digit Remains the Same eg: 45 x 11 = 45+4 / 5 = 49/5

5 – How to Multiply by 11 Numbers Larger Than 2 Digits.
eg: 1,234 x 11

6 – Al-Arquan-Al-Hindu: The Hindu Figures. Origin of our Hindu-Arabic Numbers:
0-1-2-3-4-5-6-7-8-9

7 – Addition Trick
(Great Party Trick)

DIGIT SUMS

aka DIGITAL COMPRESSION

MULTIPLICATION BY 11

11 x 2-Digit Numbers Whose Sum is 9 or Less

Here is a clever short-cut that involves Digit Sums and develops number skills.
This is perhaps our best example of what Vedic Maths is: Mental One-Line Arithmetic,
That is, how to give a quick and swift answer in mere seconds, that will astound people.
It may even come across as a great party trick, that even a 7 year old child can perform mentally.

To multiply any 2-digit number by 11, just split the digits apart and insert between them the sum of those 2 digits :

SPLITTING THE DIGITS AND ADDING THEIR SUM

eg : Multiply **3 4 x 11**

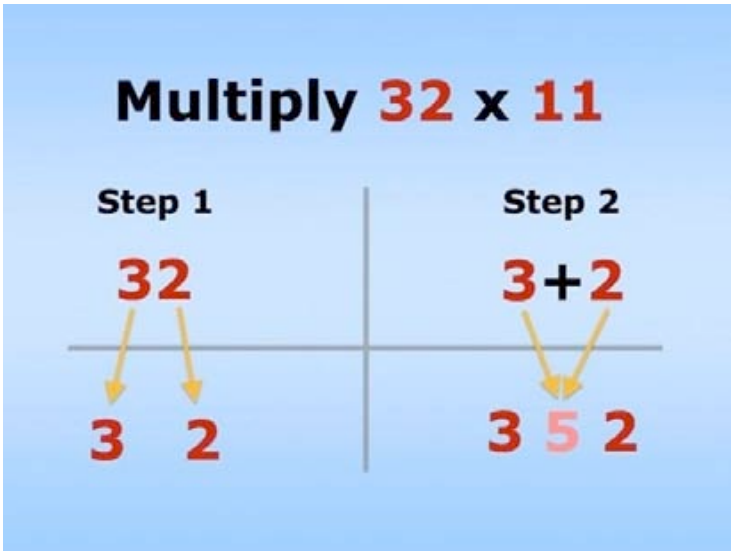
= 3 (3+4) 4

= 3 7 4
= 374

eg : Multiply **7 1 x 11**

= 7 (7+1) 1

= 7 8 1
= 781



EXERCISE 2A

Mentally Multiply by 11 the following numbers:

a. 21 =

b. 35 =

c. 42 =

d. 52 =

e. 63 =

f. 71 =

g. 81 =

h. 90 =

Notice that the Digit Sums were all "**< 9**" meaning "less than 9", or more precisely, "**less than or equal to 9**". This is mathematically written as " $\leq$ **9** ".

Answers 2A:

a) 231 **b)** 385 **c)** 462 **d)** 572 **e)** 693 **f)** 781 **g)** 891 **h)** 990

11 x 2-Digit Numbers Whose Digit Sum is Greater than 9

When the Digit Sum is "> 9" (Greater Than Nine) you will have a 2-Digit teen number. Leave the unit's digit between the 2 split digits and carry the 1 to the left to the first digit of the answer.

EXAMPLE 48 x 11

= 4 (4 + 8) 8
= 4 12 8
= 4 $_1$2 8 **nb**: the "12" can be written with a "**baby 1**" or **carry-over**

= 5 2 8

nb: (A shortcut of writing this is: 48x11= 4/4+8/8 = 4/12/8 = 5/2/8 = 528).

EXERCISE 2Ba Use the sutra: "Digit Sums" to calculate all the below.

Mentally Multiply by 11 the following numbers (whose "Digit Sum" is more than 9) :

a. 38 =

b. 28 =

c. 49 =

d. 56 =

e. 66 =

f. 79 =

g. 87 =

h. 99 =

EXERCISE 2Bb Use the NEW METHOD below to calculate all the above.

Recently in one of my classes with Mathemagics For Juniors, one of the 10 year old students commented that there is another way to do these above sums, and that it is actually quicker or as quick as the method just taught using the sutra : "Digit Sums".
I therefore need to give this **New Method** an appropriate name:
"MULTIPLICATION OF 2 ANY DIGITS NUMBERS BY 11 CAN BE SOLVED BY ADDING THE FIRST DIGIT (OF THE TEN'S COLUMN) TO THE TWO DIGIT NUMBER GIVEN & THE LAST DIGIT REMAINS THE SAME".
Can you think of a shorter name?

EXAMPLE 48 x 11

Add the First Digit "4" to the whole number = 48 + 4
and the Last Digit or Units Digit Remains the Same. = 52/8 = 528.

Answers 2Ba:

a) 3/11/8 = 418 **b)** 2/10/8 = 308 **c)** 4/13/9 = 539 **d)** 5/11/6 = 616 **e)** 6/12/6 = 726
f) 7/16/9 = 869 **g)** 8/15/7= 957 **h)** 9/18/9 = 1089

Answers 2Bb:

a) 3/11/8 = 418 **b)** 2/10/8 = 308 **c)** 4/13/9 = 539 **d)** 5/11/6 = 616 **e)** 6/12/6 = 726
f) 7/16/9 = 869 **g)** 8/15/7= 957 **h)** 9/18/9 = 1089

HOW TO MULTIPLY BY 11 NUMBERS LARGER THAN 2 DIGITS

MULTIPLICATION of a 4 DIGIT NUMBER BY ELEVEN

Sutra: ADD the NEIGHBOUR
This is the secret to multiplying larger nos. by 11

EXAMPLE: Multiply 11 x 1,234

1) Add a Zero in front and at the end of the number :
   = **0** 1 2 3 4 **0**

2) Drop the last Digit (which is 4) or add the Neighbour (which is 0) to the right of the last digit
   = 4 + 0 = **4**
   written as 01 2 3 **4** 0
   4

3) Now go to the next digit on the left which is **3**. Add the Neighbour on the right
   = 3 + 4 = **7**
   written as 0 1 2 **3** 4 0
   7 4

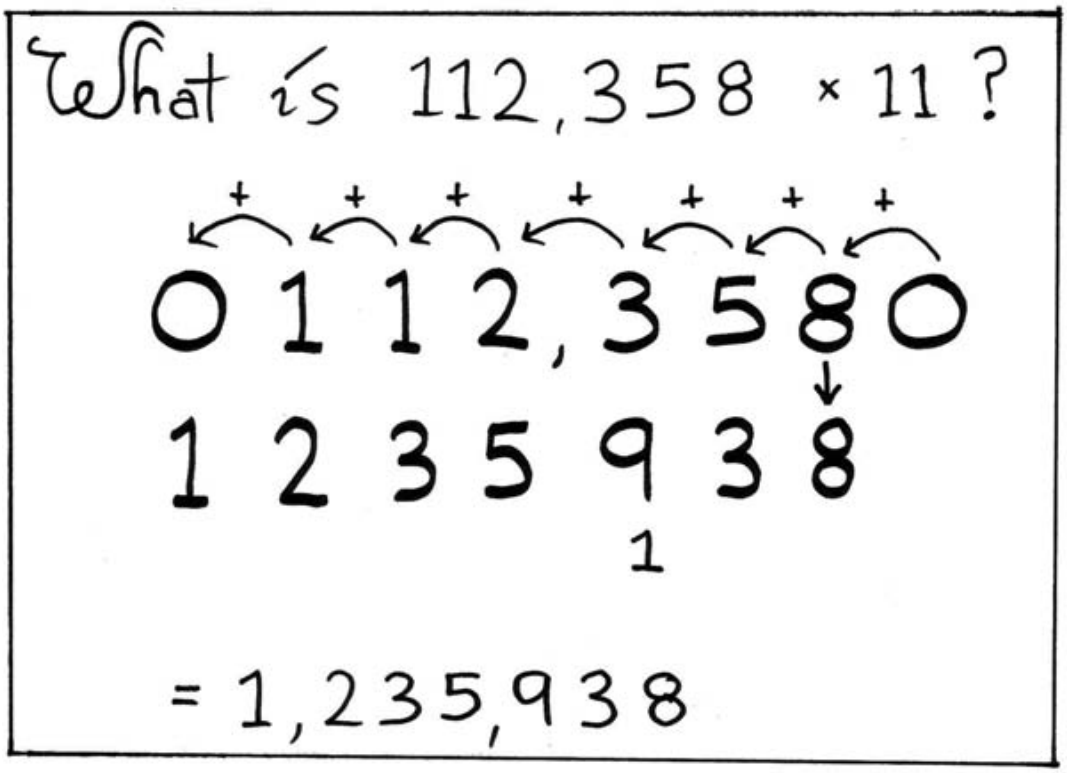
4) Now go to the next digit on the left which is **2**. Add the Neighbour
   = 2 + 3 = **5**
   written as 0 1 **2** 3 4 0
   5 7 4

5) Now go to the next digit on the left which is **1**. Add the Neighbour
   = 1 + 2 = **3**
   written as 0 **1** 2 3 4 0
   3 5 7 4

6) Now go to the next digit on the left which is **0**. Add the Neighbour
   = 0 + 1 = **1**
   written as **0** 1 2 3 4 0
   1 3 5 7 4

Thus 1234 x 11 = **13,574**

The next example shows a 6 digit number 112,358 being multiplied by 11 but involves the use of a carry-over when we add "5+8" = 13. The "1" of "13" is written on another line and gets added on the left in the next sum of "3+5" = 8 plus the carry-over makes "9".



EXERCISE 2C

MULTIPLY BY 11

a. **123** =

b. **2,453** =

c. **4,162** =

d. **53,924** =

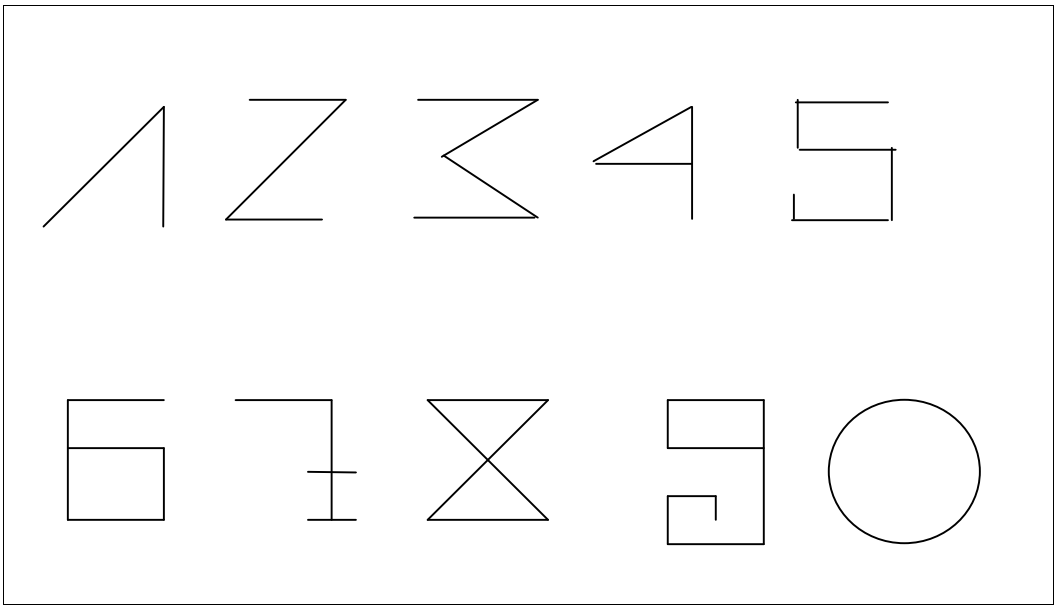
e. **112,358** =

Answers 2C:

a) 1,353 b) 26,983 c) 45,782 d) 593,164 e) 1,235,938

[Notice in this last 2 examples, when 'Adding the Neighbour', a Digit Sum in the teens appears, which meant there was a carry-over of a "1" to the next Digit on the left].

AL-ARQUAN – AL – HINDU "THE HINDU FIGURES"



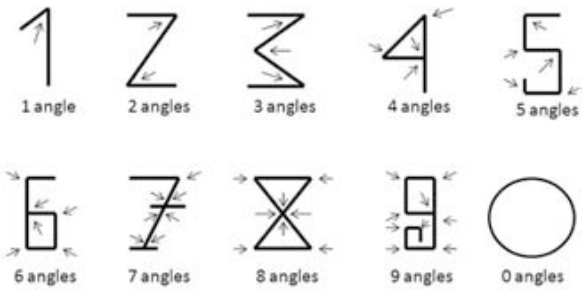
Have you ever wondered about the origin of the numbers we use today ? where the actual hand-written script came from?

A lot of people call our Western use of Numbers as Arabic Numerals, but their origin goes further back to ancient Bharat or India!

EXERCISE 2D

Mark with a coloured pencil or pen, with dots, the number of angles in each of the above 9 Hindu Numerals.

Notice on above that the Number 1 has 1 angle and the Number 2 has 2 angles. Now you know why the 7 has a bar on its up-right. There are 7 angles.
It appears that the original numerical Sanskrit language was very angular and later in time these stark straight lines and angles became stylized into the current curving figures that we now use.



ADDITION TRICK
ADD THESE 8 SIMPLE NUMBERS

EXERCISE 2E

Can you add these following 8 Numbers, as fast as you see them.
They are easy numbers to add, but the speed of adding them is what is being tested here.

```
 1,000
     10
 1,000
     20
 1,000
     60
 1,000
     10
```

(Often the people who get this correct, are those people who work everyday with numbers like bricklayers, carpenters, accountants, etc (**Answer is 4,100 not 5,000 !!!**) **nb**: this first appeared as a real summing of digits on a building site with workers writing these numbers on broken fibro slabs, and getting the sum wrong.

LESSON 3

COMPLEMENTS OF 9 and 10
Sutra: "ALL from 9 and the LAST from 10"
+
Sutra: "BY The DEFICIENCY"
How Did The Indians Do Their Times Table?
+
VEDIC ADDITION Sutra: "By The Completion"

Lesson 3
Synopsis or Summary of the Lesson

1 – Friends Of 9

2 – Friends Of 10

3 – Sutra: "All From Nine And The Last From Ten" eg: 1,000 – 345.
Subtraction of numbers from a neat round base like 100, 1,000, 10,000, 100,000 and 1,000,000

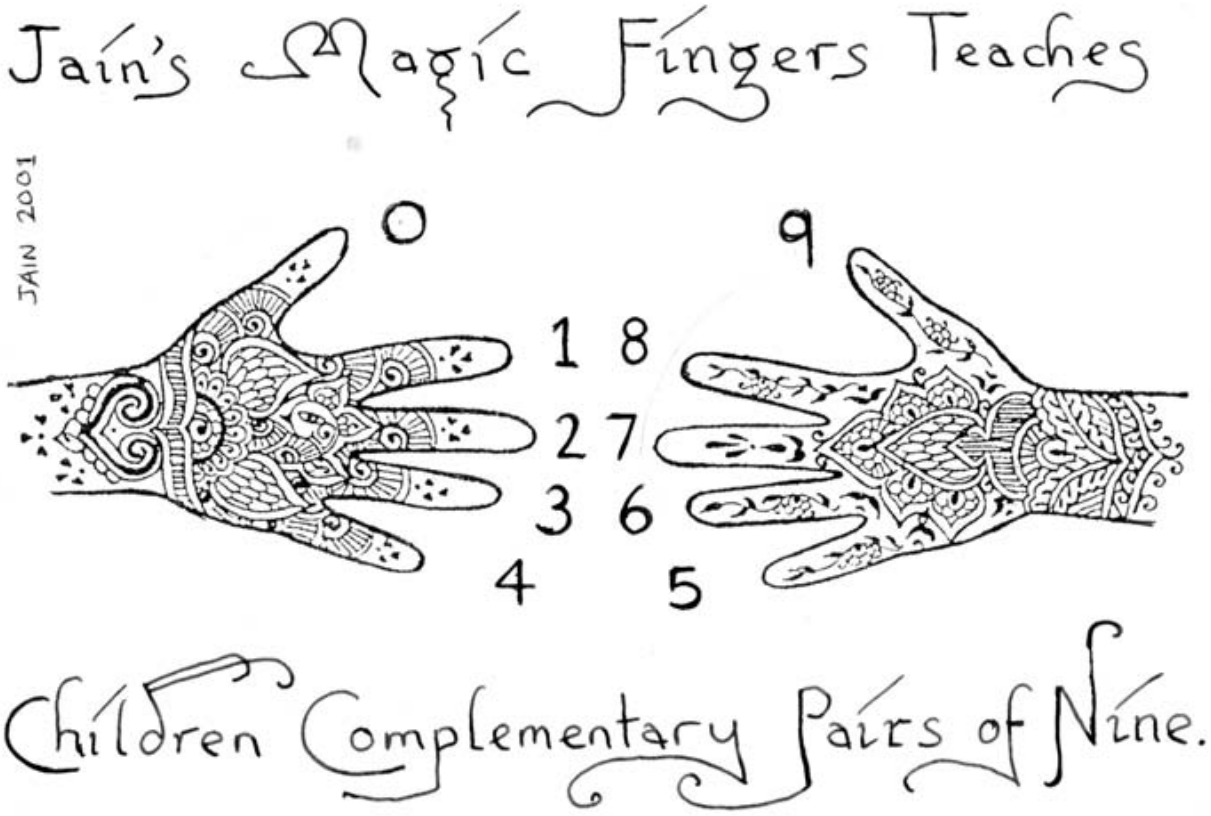
4 – Change from $10.00
eg: What is the change from $10 if I buy 11 organic apples at a cost of 47 cents each, and rounded off to the nearest 5 cents?

5 – By The Deficiency. Base Under 10. Cross Subtraction eg: 7x8 (no carry-over), and eg: 7x6 (involves a carry-over).

6 – The Hindu origin of "X" as our symbol for Multiplication.

7 – Sutra: By the Completion or Non-Completion. eg: 29 + 37
Addition of Larger Numbers.

8 – Sub-Sutra: By One Less (an invented one) For Multiplication of 2 digit "Rep Numbers" by 9 eg: 9x88



TEACHING CHILDREN THE COMPLEMENTARY PAIRS OF 9

The diagram above is a beautiful representation of how the 10 Fingers actually represent the underlying code of 9, and accentuating the Hindu invention of Zero.
Young children like it when you write these numbers on their fingers with permanent markers, and they can see for themselves, the pairs that add up to 9.

HOW DO I BEGIN To TEACH MY CHILD The BASIC FIRST PRINCIPLES OF VEDIC MATHEMATICS?

Start by singing songs to your child that will educate them with a fun understanding of all the Pairs of 9 (and all the Pairs of 10).
eg: 9 Kookaburras sitting on a branch, 3 flew away, how many left?
(You will be surprised how many teenagers in the school system do not know their Pairs of 9).
The 2 Foundations of Mathematics, that which is necessary to improve the early skills of your child, and develop confidence and memory power are:
1 – The Times Table, and
2 – The Complements of 9 and 10 aka The Friends of 9 & 10

Sutra: ALL FROM NINE AND THE LAST FROM TEN aka Af9atLf10

Pairs of 9	
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	

In ancient Sanskrit, this process of Multiplication had a special name, it is called: **NIKHILAM NAVATASCARAMAM DASATAH**
Which translates as: **ALL FROM NINE AND THE LAST FROM TEN**.
In India, it is shortened to NIKHILAM, meaning general Multiplication.
To truly learn Vedic Mathematics it is important that the student understands the **COMPLEMENTS OF NINE AND TEN**.

That means, regarding 9, that the student know all the Pairs that sum up to Nine,
In the space here on the left, write in all the Pairs of 9
aka **Friends of 9.**

Regarding 10, the student needs to know all the Pairs that sum up to Ten, like:
1 + 9 = 10, 2 + 8 = 10, 3 + 7 = 10, 4 + 6 = 10, 5 + 5 = 10 etc.
We will need to know these pairs when we begin to multiply SINGLE DIGITS BY SINGLE DIGITS like 7 x 8 and 9 x 6 etc which is really an understanding of your MULTIPLICATION TABLE.

What do you notice about the Pairs of 9 like 1+8, 2+7, 3+6, 4+5 etc?

Pairs of 10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

EXERCISE 3A

In the space here on the left, write in all the Pairs of 9 & 10
aka **Friends of 9 & 10**.

Let us practice some examples of ALL FROM NINE AND THE LAST FROM TEN, looking at quick mental subtractions from Base Numbers like 100, and 1,000 and higher.

EXAMPLE 100 minus 68

To subtract a number from 100, like **68** we say mentally, like a ritual "All From Nine And The Last From Ten" means:

9 minus **6** / 10 minus **8** = 3 / 2 = 32

If we had to set it out on paper, it would look like this:

9	10
6	**8**
3	2

To write this out in the one-line answer format required it would look like this:
100 – 68 = 9 – 6 / 10 – 8 = 3/2 = 32

EXAMPLE 1,000 minus 784

To subtract a number from 1,000, like 784 we say:
All From Nine and the Last from 10 as a One-Line Answer:
9 minus 7 / 9 minus 8 / 10 minus 4 = 2 / 1 / 6 = 216
If we had to set it out on paper, it would look like this:

9 9 10
7 8 4
2 1 6

By mentally committing to memory all your complements of 9 and 10, you will be able to, within seconds, or by mere observation, subtract any number from say a million, effortlessly.

EXAMPLE Subtract from 1,000,000 the number 893,440

9 minus 8	9 minus 9	9 minus 3	9 minus 4	10 minus 4	0
1	0	6	5	6	0
= 1 / 0 / 6 / 5 / 6 / 0 = **106,560**					

nb: if a number ends in zero, like 893,440 and this is subtracted from 1,000,000 to derive the complement, you say "All From Nine and the Last from Ten" but disregard the 0 of 637,120 and subtract the last digit 2 from 10.

EXERCISE 3B

Subtract the following numbers from their nearest round base:

From 100

a. **36** =
b. **52** =
c. **88** =

from 1,000

d. **488** =
e. **716** =
f. **44** =

(clue, think of 44 as **0**44) because there are only 2 digits and not 3 digits being subtracted from a round number with 3 zeroes).

from 10,000

g. **5,904** =
h. **8,366** =

from 100,000

i. **61,330** =
j. **222** =

from 1,000,000

k. **123,455** =
l. **78,922** =

(clue, think of 78,922 as **0**78,922 because there are only 5 digits and not 6 digits being subtracted from a round number with 6 zeroes).

ANSWERS 3B:

a. 100 – 36 = 9 – 3 / 10 – 6 = 6/4 = **64**
b. 100 – 52 = 9 – 5 / 10 – 2 = 4/8 = **48**
c. 100 – 88 = 9 – 8 / 10 – 8 = 1/2 = **12**
d. 1,000 – 488 = 9 – 4 / 9 – 8 / 10 – 8 = 5 / 1 / 2 = **512**
e. 1,000 – 716 = 9 – 7 / 9 – 1 / 10 – 6 = 2 / 8 / 4 = **284**
f. 1,000 – 044 = 9 – 0 / 9 – 4 / 10 – 4 = 9 / 5 / 6 = **956**
g. 10,000 – 5,904 = 9 – 5 / 9 – 9 / 9 – 0 / 10 – 4 = 4 / 0 / 9 / 6 = **4,096**
h. 10,000 – 8,366 = 9 – 8 / 9 – 3 / 9 – 6 / 10 – 6 = 1 / 6 / 3 / 4 = **1,634**
i. 100,000 – 61,330 = 9 – 6 / 9 – 1 / 9 – 3 / 10 – 3 / 0 = 3 / 8 / 6 / 7 / 0 = **38,670**
j. 100,000 – 00222 = 9 – 0 / 9 – 0 / 9 – 2 / 9 – 2 / 10 – 2 = 9 / 9 / 7 / 7 / 8 = **99,778**
k. 1,000,000 – 123,455 = 9 – 1 / 9 – 2 / 9 – 3 / 9 – 4 / 9 – 5 / 10 – 5 = 8 / 7 / 6 / 5 / 4 / 5 = **876,545**
l. 1,000,000 – 78,922 = 9 – 0 / 9 – 7 / 9 – 8 / 9 – 9 / 9 – 2 / 10 – 2 = 9 / 2 / 1 / 0 / 7 / 8 = **921,078**

CHANGE FROM $10

If $1 has 100 cents, (because it is formally written as $1.00)
how many cents are there in $10?
(clue, since "10" has an 1 zero, and we are multiplying by "10",
simply add another zero to the 100 cents: = ……..……
This means that when we are working out our change from a $10 note, which as 1,000 cents in it, we can easily apply this Sutra: "Af9&tLf10".
The following example is converting all this Number Theory into real practical, everyday use, like shopping at your local organic store. These exercises will involve some multiplication first, a bit of revision with what you already have learnt, so it involves 2 steps. Also, if you are say at your local supermarket, the girl at the checkout will be calculating the shopping automatically on her machine, yet you will already have the answer in your head. Thus, Vedic Maths is a fast way of checking that other people's electronic answers are correct or not.

EXAMPLE: What is the change from $10 if I buy 11 organic apples at a cost of 47 cents each, and rounded off to the nearest 5 cents?

11 x 47 = (47+4) / 7 = 51/7 = $5.17^c
$10 – $5.17^c = 1,000 – 517. Apply Sutra: Af9&tLf10 = 9–5 / 9–1 / 10–7 = 4/8/3
This amount of $4.83 rounded off to the nearest 5^c is $5.15

EXERCISE 3C

What is the change from $10, rounded off to the nearest 5^c, for these purchases:

a. **9 oranges @ 68^c** each**?**

b. **13 bananas @ 14^c** each**?**

c. **11 apples @ 49^c** each**?**

ANSWERS 3C:

a. 9x68 Use Back of the Hands, 9x table for 2 digits = 612 or $6.12. Use sutra "Af9&tLf10".
= 9–6 / 9–1 / 10–2 = 3/8/8 = $3.88 = $3.90 rounded off to the nearest 5^c.

b. 13x14 = Use Hands Palms Facing "Magic Teens" = 100+70+12 = 182 or $1.82^c. Use sutra "Af9&tLf10" = 9–1 / 9–8 / 10–2 = 8/1/8 = $8.18 = $8.20 rounded off to the nearest 5^c.

c. 11x49 = Use sutra "Digit Sums" or New Method: = (49+4)/9 = 53/9 = $5.39^c. Use sutra "Af9&tLf10" = 9–5 / 9–3 / 10–9 = 4/6/1 = $4.61 = $4.60 rounded off to the nearest 5^c.

Sutra: BY THE DEFICIENCY

BASE UNDER TEN CROSS-SUBTRACTION

We will now apply our understanding of ALL FROM NINE AND THE LAST FROM 10 to calculate the Multiplication of SINGLE DIGITS BY SINGLE DIGITS.
Obviously, all these numbers will be under 10, so the subtitle for this exercise is:
Base Under 10

EXAMPLE 9 x 7

For 9 x 7 we say ALL FROM NINE AND LAST FROM TEN. When we only have single digits, like 9 x 7, the "All From Nine" part of the Sutra does not apply, only the "Last from Ten".
Which is really an understanding of subtracting both the 9 and the 7 from 10.
Mentally we are saying 9 is 1 less than 10 which is minus 1 or "–1".
And 7 is 3 less than 10 which is minus 3 or "–3".
The setting out will look like this:
To remember that you are using Base Ten, (as distinct from Base 20 or 100) have it written in a circle above the setting out, or in brackets, like this: (10)

```
          (10)
9 x 7 =    9 – 1
         x 7 – 3
         ----------
       =   6 / 3
```

Notice, to get the "3" on the Right Hand Side, we <u>multiply vertically</u> the two Deficiencies, which is minus 1 times minus 3 giving plus or positive 3.
The answer has two parts, a left hand part and a right hand part. To clearly distinguish these two parts, the Hindu Mathematicians inserted a diagonal stroke or "forward slash" (/) underneath the minus signs, as shown above.
The minus signs indicates that the Complements are both less than Ten.
To get the "6" on the Left Hand Side, we perform a CROSS-SUBTRACTION, saying 9 minus 3 is the same as 7 minus 1. In fact, these two cross subtractions, as you will see, are always the same.
In fact, there are 4 ways of arriving at the Left Hand Side digit in the 10's column:

1. Add the two Ten's Digits (9 + 7) and subtract from 10 = 16 – 10 = 6
2. Add the Deficiencies (1 + 3) and subtract from 10 = 10 – 4 = 6
3. Cross-Subtract = 9 – 3 = 6
4. Cross-Subtract = 7 – 1 = 6

The Solution: 6 / 3 really means 6 lots of the base 10 which is 60, and 3 lots of the Units which is 3,
giving the answer of 60 + 3 = 63

When performing the mental calculation, Remember to Cross-Subtract: mentally saying: The diagonal relationship of the (9 – 3) is always the same as the other diagonal (7 –1) both giving a sum of 6.

9 – 1
X
7 – 3

The reason the "**X**" is in bold is to highlight the fact that this interesting diagonal relationship of numbers relating to their deficiencies from 10 or 100 or 1000 etc was the **origin or became the reason why we adopted the use of "X" as our symbol for Multiplication**.
Herein lies the desire for the brain to perform this even quicker, so you are encouraged to make even quicker mental short-cuts. Here is how an adept would multiply 9 x 7, with the least possible verbiage:
Nine less 3 equals 6, which is 60, and add to this one times three, equals 60 and 3, equals 63.
An even quicker mental short-cut would go like this, deleting any mental clutter:
Nine less three, six. Sixty. One times three. 3. Sixty-three.
This is the **PATH OF LEAST RESISTANCE**. It is also the **LAW OF ECONOMY**. This system will eventually be made global as it is highly efficient and stimulates the brain. Mental Calculation is superior to machine calculation. The western world adores short-cuts.

[This is originally from a JAIN MATHEMAGICS WORKSHEET, May 2006]

EXERCISE 3D

Perform the following mental, One–Line Calculations from your common Times Table. Then write it out in the format shown above.

Multiply:		
a) 8 x 7	c) 8 x 8	e) 9 x 9
b) 9 x 6	d) 8 x 6	

Sometimes the number in the Units Column, derived from the multiplication of the two excesses, exceeds 10, at which point, we slide over to the left, the "1" similar to the western method.

EXAMPLE 7 x 6

eg: 7 x 6 = 7 – 3
= 6 – 4

= 3 / $_1$2
= 4 / 2

The "1" of the "12" exceeds 10, so we carry over that "1" to the Tens Column, making 3 + 1 = 4

(Later on, when we get to Base 100 and Base 1000 you will understand that according to the number of Zeroes "0" in our Base, will determine how many digits we can have on the Right Hand Side of the Forward Slash (/). In this case, we have one zero in our Base 10, which indicates that we are forced to have only one digit on the Right hand Side. Base 100 allows 2 zeroes and Base 1,000 allows 3 zeroes on the Right hand Side).

EXERCISE 3E

Perform the following mental, One–Line Calculations for your common Times Table. Then write it out in the format shown above. Multiply:

a) 7 x 5	c) 8 x 4
b) 6 x 6	d) 7 x 3

ANSWERS to 3D

a) 8 x 7. Mentally, I subtract from 8, the deficiency of 7 from 10, which is 8 – 3 which is 5 or really 5 lots of the Base 10 which is 50, and add to this the sum of the two deficiencies multiplied, which is –2 x –3 = 6, giving 50 + 6 = 56.
The working out would look like this: (see far right hand side).
Remember to Cross-Subtract: mentally saying:
The diagonal relationship of the (8 – 3) is always the same as the other diagonal (7 –2) both giving a sum of 5.

```
          (10)
8 x 7  =   8 – 2
         x 7 – 3
           ------
       =   5 / 6
```

b) 9 x 6 = 9–4 / 1x4 = 5/4
c) 8 x 8 = 8–2 / 2x2 = 6/4
d) 8 x 6 = 8–4 / 2x4 = 4/8
e) 9 x 9 = 9–1 / 1x1 = 8/1

```
          (10)
9 x 6  =   9 – 1
         x 6 – 4
           -------
       =   5 / 4
```

```
          (10)
8 x 8  =   8 – 2
         x 8 – 2
           -------
       =   6 / 4
```

```
          (10)
8 x 6  =   8 – 2
         x 6 – 4
           -------
       =   4 / 8
```

```
          (10)
9 x 9  =   9 – 1
         x 9 – 1
           -------
       =   8 / 1
```

ANSWERS to 3E

(10)	(10)	(10)	(10)
7 x 5 = 7 – 3	6 x 6 = 6 – 4	8 x 4 = 8 – 2	7 x 3 = 7 – 3
= 5 – 5	= 6 – 4	= 4 – 6	= 3 – 7
----------	----------	----------	----------
= 2 / $_1$5	= 2 / $_1$6	= 2 / $_1$2	= 0 / $_2$1
= 3 / 5	= 3 / 6	= 3 / 2	= 2 / 1

Sub-SUTRA: BY THE COMPLETION or NON-COMPLETION

(Sanskrit title: Purana'purana'bhyam)

FOR ADDITION OF 2 DIGIT NUMBERS

EXAMPLE 47 + 48

47 + Mentally, you can add these two digits quickly by adding "3" to the
top "48" to make the top line as "47 + 3" = 50
48 which is a round number.
This means we must reduce the lower line by 3, which now becomes:
"48 – 3" = 45.
50 + So really, it is easier to be adding "50 + 45" = 95
45 This process is something that most children naturally do, when adding
------ their digits, it is a natural and simple process, and to give it a name, it
95 is referred to as one of the 14 Sub-Sutras: BY THE COMPLETION.

EXERCISE 3F

Add the following 2 digit numbers, employing this Sub-Sutra: By The Completion.

a) **16 + 17** =

b) 27 + 28 =

c) 39 + 38 =

d) 105 + 117 =

e) 998 + 113 =

f) $14.99 + $7.23 =

ANSWERS to Exercise 3F

a) 16 + 17 = (16-3)+(17+3) = 13+20 = 33
b) 27 + 28 = (27-2)+(28+2) = 25+30 = 55
c) 39 + 38 = (39+1)+(38-1) = 40+37 = 77
d) 105 + 117 = (105-3)+(117+3) = 102+120 = 222
e) 998 + 113 = (998+2)+(113-2) = 1000+111 = 1,111
f) $14.99^{c} + $7.23^{c} = 1499 + 723 = 1500 + 722 = 2000 + 222 = 2,222 =$22.22^{c}

FOR ADDITION OF LARGER NUMBERS

1 2 **3**
1 6 5
9 8 **7**
8 3 6

C3 C2 C1

Always look for the Pairs of 10, like 3+7=10 in the units column.
Call the 3 Columns: C1, C2 and C3
In C1, notice that the 3 and 7 have been bolded.
When adding the 6 and 5, think of it as 6 + 4 + 1, giving an immediate pair of 10 in the 6 + 4 and leaving a remainder of 1.
Thus C1 = two pairs of 10, giving 20 plus the 1 = 21.
Put the 1 down in the unit's column, and carry over the 2.

In C2, you have **2**+6+**8**+3+rem2 = 10+6+3+2 = 10+10+1 = 21.
Put the 1 down in the ten's column, and carry over the 2.
In C3, you have 1+**1+9**+8+rem2 = 1+10+**8+2** = 1+10+10= 21.
Thus the answer is 2,111.

EXERCISE 3G

Add the following numbers utilizing "By The Completion".

a)
4 3 4 5
7 8 0 1
3 7 6 5
1 2 9 9
5 0 1 2
_____

b)
6 2 3
2 9 6
7 8 7
8 1 4
4 4 5
3 6 8
_____

ANSWERS to Exercise 3G

a) 22,222 b) 3,333

OPTIONAL

Sub-SUTRA: "By One Less", (an invented one)

For Multiplication Of 2 DIGIT "REP NUMBERS" by 9

Refer to the anomaly that arose in Lesson 1 with "Back Of The Hands" for 9 x Two Digit Numbers. A problem arose with numbers like **9 x 88** or any two-digit number that repeats itself, like 11, 22, 33, 44 etc. These are called "Rep Digits" or Repeating Digits. These examples, like 9 x 55 could not be done on "Back Of The Hands" but here is a newly invented Vedic Sutra, called a lesser sutra or "Sub-Sutra" called "By One Less" and also involves the contents of this chapter on Complements of 10.

EXAMPLE 9 x 88

Step 1: Regarding the Last Digit or Units Number on the Right, take the Complement From 10, which is 2. Therefore the last half of the answer looks like: "___ ___ / 2"
Step 2: Regarding the First Digit or Tens Number on the Left, which is an "8" think of this as "80" and Lessen this by 1. Therefore the first half of the answer looks like:
"80 – 1 / 2" = "79 / 2 = 792.
(Comprehension of this page will sort out the smartest students from the others, as it involves extra cognitive functions).

EXERCISE 3G

Multiply the following Rep Digits by 9. Three of the possible 9 questions have been done.							
a)-	**9 x 11**	=	10 – 1 / 10 – 1	=	9 / 9	=	**0 9 9**
b)-	**9 x 22**	=	20 – 1 / 10 – 2	=	1 9 / 8	=	**1 9 8**
c)-	**9 x 33**	=		=		=	
d)-	**9 x 44**	=		=		=	
e)-	**9 x 55**	=		=		=	
f)-	**9 x 66**	=		=		=	
g)-	**9 x 77**	=		=		=	
h)-	**9 x 88**	=	80 – 1 / 10 – 8	=	7 9 / 2	=	**7 9 2**
i)-	**9 x 99**	=		=		=	

Observe all the answers in the far right side column!

(Do you see a staircasing of ascending and descending digits from 1 to 9. And look at all the central numbers of the triplets, ie: the numbers in the Tens Column!).

ANSWERS to Exercise 3G

a. 99 **b.** 198 **c.** 297 **d.** 396 **e.** 495 **f.** 594 **g.** 693 **h.** 792 **i.** 891
DID YOU KNOW: That when you observe the answers in the far right column, except for 99, all the answers come in "reversed pairs" eg: 198 (for 2x99) reversed gives 891 which is the answer for 9x99.
eg: 297 (for 3x99) reversed gives 792 which is the answer for 8x99. etc.
This is why I have written whole books on "The Magic of 9" showing internal mathematical harmonies and symmetries.

LESSON 4

Sutra: "BY THE EXCESS"
Sub-Sutra: "On The Flag"
MULTIPLICATION OF The TEEN NUMBERS
Squaring of the Teens

Lesson 4
Synopsis or Summary of the Lesson

1 – Sutra: "By The Excess"
- Multiplication of Numbers Over a Base and Near a Base.
- Base Over Ten and Cross Addition
- eg: 11x13 with No Carry-Over
- eg: 13x14 with a Carry-Over
- Sub-Sutra: "On The Flag"
- Hoisting these "excesses" in your Inner Mental Screen

2 – Why do we only have 1 digit to the Right of the Forward Slash?
Using example of 108^2 that has 2 digits to the right.

3 – The Squaring of Teen Numbers eg: 14^2.

TEEN NUMBERS FOR TEENAGERS.

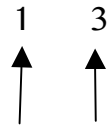
I believe that when a student can mentally multiply teen numbers swiftly, then they can be called a Vedic mathematician, and that the level of difficulty in learning this is no different or no harder than learning any other sutra in this course. ie: if they can do this chapter quite successfully, they can do anything at this level that we give them. Knowing this is like a litmus test of intelligence.

Sutra: "By The Excess"
(Multiplication of Numbers over a Base and Near a Base)
(Base Over Ten) (Cross Addition)

Here is the trick how to multiply one teen number by another teen number, in your head, in seconds! By applying a simple vedic formula, you can instantly solve say 11 x 13 or 14 x 16 by use of this Sutra: By The Excess.

EXAMPLE 11 x 13

Just think of the two excesses, asking yourself, how much are these two numbers more than the Base of 10, and raise those numbers on your **INNER MENTAL SCREEN**.
This raising of the excesses is known as "**ON THE FLAG**". At the end of this exercise, you will need to tick or highlight this sub-sutra on Page 9.
The excesses are 1 and 3. All you need to do is add the excess of 1 to the other number 13, or add the excess of 3 to the other number 11, and in both cases the sum is 14 or 14 lots of the base 10, at which point we hold in our Memory Bank the number of 14 x 10 = 140, and add to this the multiplication of the two excesses which is 1 x 3 = 3, giving the mental, one-line answer of 143.
The visual way of describing this sutra is to set it out like this, by forming a structure
For the numbers to fall down into, like in the introduction to the movie "The Matrix" where numbers are just scrolling down infinitely.



11 x 13 = _____ / ___

We say: 11 x 13 Equals "Something" with "One Digit To The Right.

11 x 13 = 11 + the excess of 3 / multiply the two excesses
= 11 + 3 / 1 x 3
= 14 / 3
= 143

EXAMPLE 13 x 14 with a Carry-Over

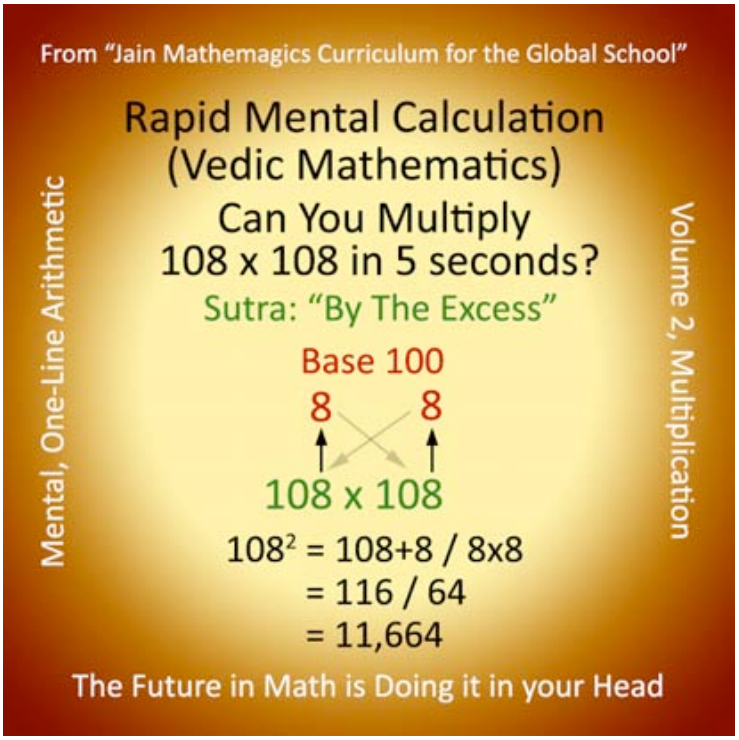
3 4

13 x 14 = _____ / ___

We say: 13 x 14 Equals "Something" with "One Digit To The Right.

13 x 14 = 13 + the excess of 4 / multiply the two excesses
= 13 + 4 / 3 x 4
= 17 / 12 but we are only allowed one digit to the right, so express the 12 as a baby "1" followed by the 2, like this:
= 17 / $_1$2
= 18/2
= 182

Why do we only have 1 Digit to the Right of the Forward Slash?



To explain this, let us look at the example of 108 x 108. Since the nearest base is Base 100, which has 2 zeroes, we are required to have 2 spaces or 2 digits after the forward slash, the setting out would be like this:

108 x 108 = _____ / ___ ___

This understanding will lead the student to doing calculations at the Speed of Thought.

EXERCISE 4A

Multiply the following Teen Numbers, mentally, then show the setting out on paper.		
a) 12 x 13 =	**b) 13 x 14 =**	**c) 15 x 16 =**
d) 17 x 18 =	**e) 19 x 12 =**	**f) 13 x 16 =**
g) 14 x 17 =	**h) 11 x 18 =**	**I) 12 x 16 =**
j) 16 x 14 =		

THE SQUARING OF THE TEEN NUMBERS

This involves the Sutra: **BY THE EXCESS**, or cryptic word-formula:

"By whatever the extent of the excess,
add on that excess and square that excess".

Often these formulas appear to make no sense, but when they are applied, they make the calculations effortless. Simply add on the excess and square it. You are mainly concerned here with that excess number above ten.
eg when I am squaring 14, then the excess is "4". I am mentally flagging that "4" in my consciousness or raising that "4" upon my Inner Mental Screen.
Its that simple, add it and square it.

EXAMPLE 14 x 14

14 x 14 = 14 + **4** / **4**^{2} =18 / $_1$6 = 19 / 6 = 196
nb: (this involves a "carry-over").

The Mental Path of Least Resistance would quickly say:
14, 4, 180, $_1$6, 196. This is the swiftest level of calculation that you are striving for.
The number "180" is derived by adding the first 2 numbers: "14+4" and getting 18. But really, this is 18 lots of Base 10 which gives the first part of the answer: "180".

Below are 2 other ways to do the same mental calculation, offered as number theory.

Method 1:

4 4
↑ ↑

14 x 14 = _____ / ___

Method 2:

The setting out for this 2nd method would look like this:
This is the long way, it is only shown for theory, so keep doing the mental calculations first. Observe that the cross addition of
14 + 4
14 + 4
which has a sum of 18, involves the above 2 lines of setting out, can be smartly shortened to a mental one-line answer,
when you say: 14 + the excess of the other number, which is 4, makes 18. It is actually 18 lots of the Base Ten, so straight away you can say 180, which gives the Left Hand Side of the Answer;
then I add to this 4 x 4 which is 16, and add this to the 180, making 196.

14 x 14 = 14 + 4
14 + 4
_____
= 18 / $_1$6

= 19 / 6
= 196

EXERCISE 4B

Square the following Teen Numbers. Let all your answers be written as a One-Line Answer in this format:

14 x 14 = 14 + 4 / 4^2 = 18 / $_1$6 = 19/6 = 196

a) 11 x 11 =	
b) 12 x 12 =	
c) 13 x 13 =	
14 x 14 =	14 + 4 / 4^2 = 18 / $_1$6 = 19 / 6 = 196
d) 15 x 15 =	
e) 16 x 16 =	
f) 17 x 17	
g) 18 x 18 =	
h) 19 x 19 =	

ANSWERS to Exercise 4A

a) 12 x 13 = 12 + 3 / 2 x 3 = 15 / 6 = 156

b) 13 x 14 = 13 + 4 / 3 x 4 = 17 / 12 = 17 / $_1$2 = 18/2 =182.

nb: the "1" of the "12" gets carried over to the 17.

c) 15 x 16 = 15 + 6 / 5 x 6 = 21 / 30 = 21 / $_3$0 = 24/0 = 240

d) 17 x 18 = 17 + 8 / 7 x 8 = 25 / 56 = 25 / $_5$6 = 30/6 = 306

e) 19 x 12 = 19 + 2 / 9 x 2 = 21 / 18 = 21 / $_1$8 = 22/8 = 228

f) 13 x 16 = 13 + 6 / 3 x 6 = 19 / 18 = 19 / $_1$8 = 20/8 = 208

g) 14 x 17 = 14 + 7 / 4 x 7 = 21 / 28 = 21 / $_2$8 = 23/8 = 238

h) 11 x 18 = 11 + 8 / 1 x 8 = 19 / 8 = 198

nb: there is only one digit on the right. No carry-over.

i) 12 x 16 = 12 + 6 / 2 x 6 = 18 / 12 = 18 / $_1$2 = 19/2 = 192

j) 16 x 14 = 16 + 4 / 6 x 4 = 20 / 24 = 20 / $_2$4 = 22/4 = 224

ANSWERS to Exercise 4B

a) 11 x 11 = 11 + 1 / 1^2 = 12 / 1 = 121

b) 12 x 12 = 12 + 2 / 2^2 = 14 / 4 = 144

c) 13 x 13 = 13 + 3 / 3^2 = 16 / 9 = 169

d) 15 x 15 = 15 + 5 / 5^2 = 20 / 25 = 22/5 = 225

e) 16 x 16 = 16 + 6 / 6^2 = 22 / 36 = 25/6 = 256

f) 17 x 17 = 17 + 7 / 7^2 = 24 / 49 = 28/9 = 289

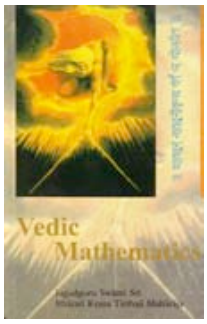
g) 18 x 18 = 18 + 8 / 8^2 = 26 / 64 = 32/4 = 324

h) 19 x 19 = 19 + 9 / 9^2 = 28 / 81 = 36/1 = 361

It is important that you learn or memorize all these squared teen numbers, like a sequence:

...100 – 121 – 144 – 169 – 196 – 225 – 256 – 289 – 324 - 361...

It helps improve your Memory Power and builds Mathematical Confidence.



LESSON 5

TRACHTENBERG'S METHOD
To Mentally Solve 1 Digit x 2 Digits
eg: 6 x 24

Lesson 5
Synopsis or Summary of the Lesson

1 – Trachtenberg's life

2 – Mentally Solving 1 Digit x 2 Digit Numbers like 4x48

3 – Mentally Solving 1 Digit x 3 Digit Numbers like 4x345

4 – Begin with numbers under 5 like 3x34 then progress to numbers over 5 like 7x89

5 – Test students with numbers written on board, like 4x86, as a one-line answer, then progress to saying the numbers said out aloud, no writing on the board, no pen and paper, just from your Inner Mental Screen.

6 – Trataka: Mindless Gazing

7 – Cubing Numbers like 4x4x4 or 4^3, using the Trachtenberg Speed Method.

8 – Learning the Sequence of Cubic Numbers:
1 – 8 – 27 – 64 – 125 – 216 – 343 – 512 – 729 –

9 – Predicting The Answer By Seeing The Pattern
eg: 3x37, 6x37, 9x37 leads to the intuitive knowing of 12x37

Mentally Solving 1 Digit x 2 Digits

In the realm of Multiplication, where any 2 Digit Numbers are multiplied by any single Digit Numbers, there is a beautiful and simple technique.
This system of multiplying 2 Digits by 1 Digit actually does not appear in Vedic Mathematics by Bharati Krsna Tirthaji. It first appeared to me in a book called:
"The **Trachtenberg Speed System of Basic Mathematics**"
but I have modified it to make it even simpler.
(Do Research on him: how this Swiss mathematician developed this system when a prisoner in a German Nazi camps).
The definition of Vedic Mathematics is 'Mental, One-Line Arithmetic'. I encourage all children to learn this amazingly swift mental method… moving across the line, rather than calculating traditionally down the page.

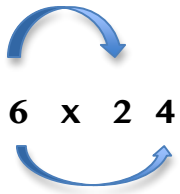
EXAMPLE
How to mentally multiply 6 x 24 in a few seconds

Visualize "24" as "2" and "4" and multiplying both digits independently by "6".

Multiply by 6 both digits of 24.

Multiply by 6 the first digit "**2**" (see top arrow)

Then multiply by 6 the second digit "4" (see bottom arrow)



Thus upon your mental screen visualize
2 x 6 / 4 x 6 which becomes: 12 / 24.
(note: The forward slash / is used as a place marker only).
What we are wanting here, visually, is to hold in our mental screen, the two pairs:

INNER MENTAL SCREEN HOLD HERE THE 2 PAIRS OF 12 and 24 and mentally repeat these 2 Pairs 3 times So that the numbers remain strongly lit in your screen.		
1 2	←	**2 4**

Sometimes, it can also be written as: 12 / $_{2}$4. The underlined "2" is a carry-over.
Your focus now is to have only one digit on the right-hand-side of the slash.
The quick answer is achieved by adding the "2" of the "24" over to the left-hand-side, appearing like this:
12 + 2 / 4 = 14 / 4.

When done quickly in the Mind, the mental steps are:
6 x 24 = 6 x 2 / 6 x 4 = 12 / 24 = 12+2 / 4 = 14 / 4 = 144

It's that simple, keep practicing with other examples:

EXAMPLE 8 x 18

18 x 8 = 1x8 / 8x8 = 8 / 64 = 8+6 / 4 = 14 / 4 = **144**

EXAMPLE 7 x 71

7 x 71 = 7x7 / 7x1 = 49 / 7 = **497**

Notice there is no digit to slide over to the left. Therefore this example is a faster to calculate than the others by a few seconds.

EXAMPLE 3 x 144

3 x 144 = 3 x 1 / 3 x 4 / 3 x 4 = 3 / 12 / $_{1}$2 = 3 / 12+1 / 2 = 3 / $_{1}$3 / 2
= 3+1 / 3 / 2 = 4 / 3 / 2 = **432**

EXERCISE 5A

Mentally multiply the following:

a) 6 x 23 =

b) 4 x 48 =

c) 8 x 52 =

d) 7 x 64 =

e) 5 x 75 =

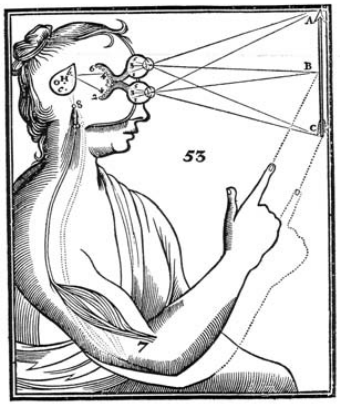
f) 8 x 88 =

g) 6 x 61 =

h) 6 x 134 =

i) 4 x 243 =

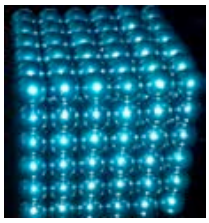
j) 7 x 456 =



TRATAKA: Mindless Gazing: To strengthen the 3rd Eye.
The definition of Vedic Mathematics is 'Mental, One-Line Arithmetic'. I encourage all children to learn this amazingly swift mental method… moving across the line, rather than calculating traditionally down the page. It is of great value to do such sums upon the visualized 'blackboard in your mind'. The ancient Indian civilization practiced mental gazing techniques, called 'Trataka', where the fixed gaze ultimately awakened the Third Eye and gave insight into the science of Complementary Colors in the Artist's Color Wheel, e.g. staring at a red star for 3 minutes, then closing the eyes produces an after effect of a green star!
Another important Trataka exercise is staring at a candle flame, for 3 minutes, then close your eyes to study intensely the **after-image**.
Thus, 'holding' these numbers in your Mind's Eye, helps build the Mental Muscle. Vedic Mathematics is really about re-learning the lost art of '**Holding Digits on the inner Mental Screen**'.
When in the movie called the 'Rain Man' the central character or Idiot Savante was asked: "How do you perform correctly such complex mathematical tasks"? He replied: "I see it". This is the supreme Art of Pattern Recognition symbolized by the Right Visual Cortex of the Feminine Intuitive side of the Brain. Enjoy this ancient code.

ANSWERS to Exercise 5A

a) 6 x 23 = 6 x 2 / 6 x 3 = 12 / $_1$8 = 13 / 8 = 138
b) 4 x 48 = 4 x 4 / 4 x 8 = 16 / $_3$2 = 19 / 2 = 192
c) 8 x 52 = 8 x 5 / 8 x 2 = 40 / $_1$6 = 41 / 6 = 416
d) 7 x 64 = 7 x 6 / 4 x 7 = 42 / $_2$8 = 44 / 8 = 448
e) 5 x 75 = 5 x 7 / 5 x 5 = 35 / $_2$5 = 37 / 5 = 375
f) 8 x 88 = 8 x 8 / 8 x 8 = 64 / $_6$4 = 70 / 4 = 704
g) 6 x 61 = 6 x 6 / 6 x 1 = 36 / $_0$6 = 36 / 6 = 366
h) 6 x 134 = 6 x 1 / 6 x 3 / 6 x 4 = 6 / 18 / $_2$4 = 6 / 18 + 2 / 4 = 6 / $_2$0 / 4
= 6 + 2 / 0 / 4 = 8 / 0 / 4 = 804
i) 4 x 243 = 4 x 2 / 4 x 4 / 4 x 3 = 8 / 16 / $_1$2 = 8 / 16 + 1 / 2 = 8 / $_1$7 / 2
= 8 + 1 / 7 / 2 = 9/7/2 = 972
j) 7 x 456 = 7 x 4 / 7 x 5 / 7 x 6 = 28 / 35 / $_4$2 = 28 / 35 + 4 / 2 = 28 / $_3$9 / 2
= 28 + 3 / 9 / 2 = 31/9/2 = 3,192



This Lesson on Trachtenberg 1 Digit x 2 Digits helps solve the **Sequence of Cubic Numbers**.

EXAMPLE = 4^3 = 4 CUBED = 4 x 4 x 4

Think of 4 Cubed not just as 4x4x4 but rather as 4x16 thus allowing this important multiplication to be solved mentally via Trachtenberg's Method.

4 x 16 = 4 x 1 / 4 x 6 = 4 / 24 = 4 / $_2$4 = 6 / 4 = 64

Having learnt how to multiply all the Cubic Numbers, learn them as a Sequence, as later on, when studying Cube Roots, these numbers must be memorized to perform powerful feats of Rapid Mental Calculation.

EXERCISE 5B

Mentally multiply the following cubic numbers:
Write the solution as a one-line answer as shown in the example of 4^3.

a) $\mathbf{1^3}$ = 1 x 1 x 1 =1

b) $\mathbf{2^3}$ =

c) $\mathbf{3^3}$ =

d) $\mathbf{4^3}$ = 4 x 4 x 4 = 4 x 16 = 4 x 1 / 4 x 6 = 4 / 24 = 6 / 4 = **64**

e) $\mathbf{5^3}$ =

f) $\mathbf{6^3}$ =

g) $\mathbf{7^3}$ =

h) $\mathbf{8^3}$ =

i) $\mathbf{9^3}$ =

ANSWERS to Exercise 5B

a) 1^3 = 1x1x1 = **1**
b) 2^3 = 2x2x2 = **8**
c) 3^3 = 3x3x3 = 3x9 = **27**
d) 4^3 = 4x4x4 = 4x16 = 4/24 = 6/4 = **64**
e) 5^3 = 5x5x5 = 5x25 = 10/25 = 12/5 = **125**
f) 6^3 = 6x6x6 = 6x36 = 18/36 = 21/6 = **216**
g) 7^3 = 7x7x7 = 7x49 = 28/63 = 34/3 = **343**
h) 8^3 = 8x8x8 = 8x64 = 48/32 = 51/2 = **512**
i) 9^3 = 9x9x9 = 9x81 = 72/9 = **729**

Memorize this **Sequence of Cubic Numbers**, in this order:

1 – 8 – 27 – 64 – 125 – 216 – 343 – 512 – 729 –

$\mathbf{12^3}$ = 12x12x12 = 12x144 = 12x1/12x4/12x4 = 12/48/48 = $12/_48/_48$ = $12/_52/8$ = 17/2/8 = 1,728

Predicting The Answer By Seeing The Pattern!

eg: 3**x**37, 6**x**37, 9**x**37 leads to the Intuitive Knowing of 12**x**37

EXERCISE 5C

Multiply the following 1 Digit x 2 Digit numbers, using Trachtenberg's Method, but only do the first 3 (a, b & c): writing the solution as a one-line answer.
When you see the pattern, you can mentally multiply the rest.

a) **3 x 37** =

b) **6 x 37** =

c) **9 x 37** =

d) **12 x 37** =

e) **15 x 37** =

f) **18 x 37** =

g) **21 x 37** =

h) **24 x 37** =

i) **27 x 37** =

From this experience, you will learn that Trachtenberg's Method not only solves any 1 Digit x 2 Digit Numbers, it also solves any 2 Digit x 2 Digit Numbers! eg: 27 x 37 (see the answers for d, e, f, g, h, and i).

ANSWERS to Exercise 5C

a)	**3 x 37** =	3x3/3x7	= $9/_{2}1$	= 11/1 = **111**
b)	**6 x 37** =	6x3/7x7	= $18/_{4}9$	= 22/2 = **222**
c)	**9 x 37** =	9x3/9x7	= $27/_{6}3$	= 33/3 = **333**
d)	**12 x 37** =	12x3/12x7	= $36/_{8}4$	= 44/4 = **444**
e)	**15 x 37** =	15x3/15x7	= $45/_{10}5$	= 55/5 = **555**
f)	**18 x 37** =	18x3/18x7	= $54/_{12}6$	= 66/6 = **666**
g)	**21 x 37** =	21x3/21x7	= $63/_{14}7$	= 77/7 = **777**
h)	**24 x 37 =**	24x3/24x7	= $72/_{16}8$	= 88/8 = **888**
i)	**27 x 37 =**	27x3/27x7	= $81/_{18}9$	= 99/9 **= 999**

LESSON 6

Sutra: "BY The EXCESS"

- SQUARING OF NUMBERS from 50 to 60 eg: 52^2

Sutra: "BY The DEFICIENCY" eg: 97 x 98

- BASE 100 eg: 108 x 109
- BASE 1,000 eg: 1,011 x 1023

Lesson 6
Synopsis or Summary of the Lesson

1 – Squaring of Numbers From 50 to 60 eg: 54^2
– Indian Method, Invention of the Zero

2 – Multiplying Numbers in the 90s using Sutra: By The Deficiency,
Using Base Under 100 and Employing "Cross-Subtraction"
– Squaring of the Numbers in the 90s

3 – Multiplying Numbers over 100 using Sutra: "By The Excess" but Near a Base,
Using Base Over100 and Employing "Cross-Addition"
eg 108 x 109 with no carry-over

4 – Multiplying Numbers over 100 using Sutra: "By The Excess" but Near a Base,
eg: 113 x 114 involving a Carry-Over

5 – Multiplying Numbers over 1,000 using Sutra: "By The Excess" but Near a Base,
Using Base Over1,000 and Employing "Cross-Addition" eg 1,008 x 1,009

The SQUARING OF NUMBERS FROM 50 To 60

Here is a simple, delightful and elegant way to square all the numbers in the 50s, mentally, in 3 quick steps. It is also A GREAT **PARTY TRICK**, getting the mental answer fasting than someone who is challenging you with their electronic calculator!

EXAMPLE = 53^2 **Indian Invention of the Zero**

STEP 1: **53^2** = Visualize the predicted Base 100 format for the digits to appear in:

_ _ / _ _

The 2 digits on the Right are determined by the 2 Zeroes in the Base 1**00**.

STEP 2: Square the first digit "5" of the "**5**3" and add the last digit of the "5**3**", and there's your half your answer!

= 5^2 + 3 / _ _ = 28 / _ _

STEP 3:

Square the last digit 3 and tag this to the end of the predicted format: = 2 8 / _ 3^2

STEP 4: = 28 / 09 = 2,809

As a Mental One-Line Answer, it would appear as:

53^2 = 5^2 + 3 / 3^2 = 28 / 09 = 2,809.

EXERCISE 6A

Square the following numbers in the Fifties.
Do them both mentally and in the format shown here for 53^2 as a One-Line Answer.

a) 51 x 51 =

b) 52 x 52 =

c) 53 x 53 = **53^2** $= 5^2 + 3 / 3^2$ = 28 / 09 = 2,809

d) 54 x 54 =

e) 55 x 55 =

f) 56 x 56 =

g) 57 x 57 =

h) 58 x 58 =

i) 59 x 59 =

The swiftness of arriving at these answers is quite dazzling.
When you have practiced **the Squaring of all the Numbers in the 50s** you will realize how simple it is.
Perhaps you will start using these particular examples as a fun and startling **party trick**.
The goal obviously is not to show off and pretend that you have mathematical occult powers, but rather that the rapidly forth-coming answers are based on pure patterns!
And that they are shareable, not mysterious.

ANSWERS to Exercise 6A

a) 51 x 51	= 5x5 + 1 / 1 x 1	= 25 + 1 / _ 1	= 26 / 01	= **2,601**
b) 52 x 52	= 5x5 + 2 / 2 x 2	= 25 + 2 / _ 4	= 27 / 04	= **2,704**
c) 53 x 53	= 5x5 + 3 / 3 x 3	= 25 + 3 / _ 9	= 28 / 09	= **2,809**
d) 54 x 54	= 5x5 + 4 / 4 x 4	= 25 + 4 / 16	= 29 / 16	= **2,916**
e) 55 x 55	= 5x5 + 5 / 5 x 5	= 25 + 5 / 25	= 30 / 25	= **3,025**
f) 56 x 56	= 5x5 + 6 / 6 x 6	= 25 + 6 / 36	= 31 / 36	= **3,136**
g) 57 x 57	= 5x5 + 7 / 7 x 7	= 25 + 7 / 49	= 32 / 49	= **3,249**
h) 58 x 58	= 5x5 + 8 / 8 x 8	= 25 + 8 / 64	= 33 / 64	= **3,364**
i) 59 x 59	= 5x5 + 9 / 9 x 9	= 25 + 9 / 81	= 34 / 81	= **3,481**

NIKHILAM BASE 100
Sutra: BY THE DEFICIENCY
MULTIPLYING NUMBERS IN THE NINETIES eg: 98 x 97
USING "CROSS-SUBTRACTION"

EXAMPLE 97 x 98

Watch how it can be solved within 4 seconds of mental working out when performed in the correct Base of 100, and using the sutra: By The Deficiency
Insert or write the Base of 100 inside a circle or brackets:

97 – 03
98 – 02 You can cross-subtract two ways: (97 – 2) or (98 –3)
---------- Both cross-subtractions give 95 or 95 lots of the Base 100 = 9,500
95 / _ _ Then multiply the two deficiencies of 2 and 3
9,506 A **zero** is inserted before the 6 as we need to have 2 distinct digits after the forward slash symbol.

As a Mental One-Line Answer: The mental chatter would go like this, ultimately simplified:
From 97, I subtract the Deficiency from 100 of the other number which is (100 – 98 = 2) making 97 – 2 = 95, which is really 95 lots of my Base 100, so I say 9,500.
I now add to this the multiplication of the two Deficiencies which are 03 x 02 = 06, giving me the quick answer of 9,500 and 6 = 9,506.
Quickly, I could just as well say: **97 less 2, 9,500, 3x2=6, 9,506**.
You want to get to this level, no mucking around.

As a One-Line of Arithmetic:
97 x 98 = 97 – 2 / 2 x 3 = 95 / 06 Isn't that Beautiful! So fast, so efficient.

nb: In all these lessons, there is no need to do all the exercises below in Exercise 6B, which has 7 questions to solve, but rather just do 4, and leave the other 3 for the following day. This is based on the **Kumon** program, an effective Japanese system of thought that expresses the fact that by doing some revision, or homework, the next day, will help you the student to remember for life the content of that information, that is, it will lock it into your brain and be stored for future use.

EXERCISE 6B

Use both methods shown above: working down the page and working swiftly across the line, in the Base of 100, to solve the following:
The first multiplication has been done for you to set the layout of your answer.
Ultimately we do not want to use the box method in the middle, but rather we want to use the swift mental One-Line Answer done at The Speed Of Thought.

a)-	98 x 96 =	9 8 – 02 9 6 – 04 9 4 / 08	=	98 – 4 / 2 x 4 = 94 / 08 = 9,408
b)-	96 x 95			
c)-	94 x 93			
d)-	98 x 92			
e)-	97 x 96			
f)-	98 x 94			
g)-	88 x 98			

ANSWERS to Exercise 6B

a) 98 x 96	= 98 – 4 / -02 x -04= 94 / 08	= 9,408
b) 96 x 95	= 96 – 5 / -04 x -05= 91 / 20	= 9,120
c) 94 x 93	= 94 – 7 / -06 x -07= 87 / 42	= 8,742
d) 98 x 92	= 98 – 8 / -02 x -08= 90 / 16	= 9,016
e) 97 x 96	= 97 – 4 / -03 x -04= 93 / 12	= 9,312
f) 98 x 94	= 98 – 6 / -02 x -06= 92 / 12	= 9,212
g) 88 x 98	= 88 – 2 / -12 x -02= 86 / 24	= 8,624

Mural by Jain 1999 "Dolphusion".
(Thanks to Aaron Lutze, my web assistant, for his computer skills designing this dvd cover).

THE SQUARING OF THE NUMBERS IN THE NINETIES eg 98 x 98

"By whatever the extent of the Deficiency,
lessen it still further by that Deficiency,
and set up the Square thereof of that Deficiency".

(Remember, every time we have learnt a new sutra, soon, like this one now, we need to tick it off on the chart of all the sutras to indicate that we have learnt it. See page 9).

EXAMPLE 98 x 98 or 98^2 in Base 100

98 Squared:
Think only of the Deficiency which is (100 – 98) = **2**. The Sutra above says to lessen the Number 98 by that Deficiency which is 2, making it (98 – 2) = 96 or 96 lots of the Base 100 which is really 9,600, and add to that the square of the Deficiency which is (2 x 2) or 2^2 = 4. Summarized: we lessen the deficiency, then square the deficiency. So the answer is 9,600 + 4 = 9,604.

As a swift One-Line Answer:
98^2 = 98 – 2 / 2 x 2 = 96 / **0**4 = 9,604

THE INVENTION OF ZERO

(Remember that we need 2 Digits on the Right Hand Side of the Forward Slash governed by the 2 Zeroes in our Base 100). The reason that the Zero is highlighted above, is that here is the **Origin of the humble Zero**, as we shifted from Base 10 to Base 100, our answers evolved intelligently to accommodate a highly sophisticated Place Value System, that led also to the discovery of the Decimal System and the Decimal Point that we all now use. It was used by the Hindus, several thousand of years ago, with rumors of having its origin in Iraq, ancient Babylonia 12,000 years ago, that today amazes the modern world with its ingenious use of its stepped pyramids or ziggurats that were really Planetary Observatories, the mathematics of which could not have been achieved without use of the Zero. I believe now that the greatest invention in 2,000 years was the origin and the use of the Zero, for without it we would have no binary code, therefore no modern silicon-chipped computers, therefore no rockets to the moon, in fact, no modern civilization as we know it. Without this quaint, little, shy and modest Zero, we would still be in the Dark Ages.

EXERCISE 6C

Quickly determine the multiplication of all the squares in the nineties. Use One-Liners. Remember: whatever the Deficiency, just subtract it, then square it!

a) 99 x 99 = 99 – 1 / 1^2 = _____ / ____ =

b) 97 x 97 =

c) 96 x 96 =

d) 95 x 95 =

e) 94 x 94 =

f) 93 x 93 =

g) 92 x 92 =

h) 91 x 91 =

ANSWERS to Exercise 6C

a) 99 x 99	= 99 – 1 / _ 1^2 = 98 / 01	= 9,801
b) 97 x 97	= 97 – 3 / _ 3^2 = 94 / 09	= 9,409
c) 96 x 96	= 96 – 4 / _ 4^2 = 92 / 16	= 9,216
d) 95 x 95	= 95 – 5 / _ 5^2 = 90 / 25	= 9,025
e) 94 x 94	= 94 – 6 / _ 6^2 = 88 / 36	= 8,836
f) 93 x 93	= 93 – 7 / _ 7^2 = 86 / 49	= 8,649
g) 92 x 92	= 92 – 8 / _ 8^2 = 84 / 64	= 8,464
h) 91 x 91	= 91 – 9 / _ 9^2 = 82 / 81	= 8,281

Sutra: "BY THE EXCESS" OVER The BASE OF 100

(NIKHILAM SUTRA **means general multiplication)**
(for EASY MULTIPLICATION Of NUMBERS ABOVE Or BELOW A BASE LIKE TEN, HUNDRED, THOUSAND, MILLION)

EXAMPLE 103 x 104 in Base 100

The secret to obtaining this answer mentally, in one or two seconds, is to recognize that there is a visual pattern. The answer will be "something" on the Left Hand Side (LHS) followed by "2 digits on the Right Hand Side" (RHS).
Using my Inner Mental Screen, I visualize the following:

_____ / __ __

When you can forsee this Pattern, the Future appears in the Now, its like the numbers just fall into their allowed place, as naturally as rain falls down. Its like we are contacting another part of our Highest Potential State, the Answer is already there, we just need to Access it.
We think now of only the 2 Excesses, saying to ourself: How much is 103 above the Base of 100, and how much is 104 above the Base of 100.
We mentally raise those two digits of "3" and "4" in our Inner Mental Screen. This process relates to another Sutra called YAVADANAM which means "to temporarily raise up, or hoist up, like a flag".
It just means that we are learning how to hold digits in our Memory Bank, kind of putting them aside until we need them. Vedic Mathematics is about strengthening this ability, and it stimulates the 3rd Eye.
I now select one of the numbers, say "104" and add to it the excess of the other number, say the "3" of the "103". This gives the LHS of the solution.
Then I multiply those 2 excesses held in my Memory Bank, which is "3" x "4".
Now the Solution will begin to look something like this:
= 104 + 3 / 3 x 4
= 107 / 12
= 10,712

Here it is in picture form:

3 4

↑ ↑

103 x 104 = _____ / ___ ___

I prefer that you learn to do this mentally, as shown above, it only takes one or two seconds to do it in your head. Then you can learn the written format shown below.
I have found in classes that when I teach the following written form first, the students find it difficult to learn the mental format. So if you are teacher, please bear this in mind.
The following written method will reveal another hidden pattern, regarding LHS part of the answer, "107" how it can be obtained by two similar sums:

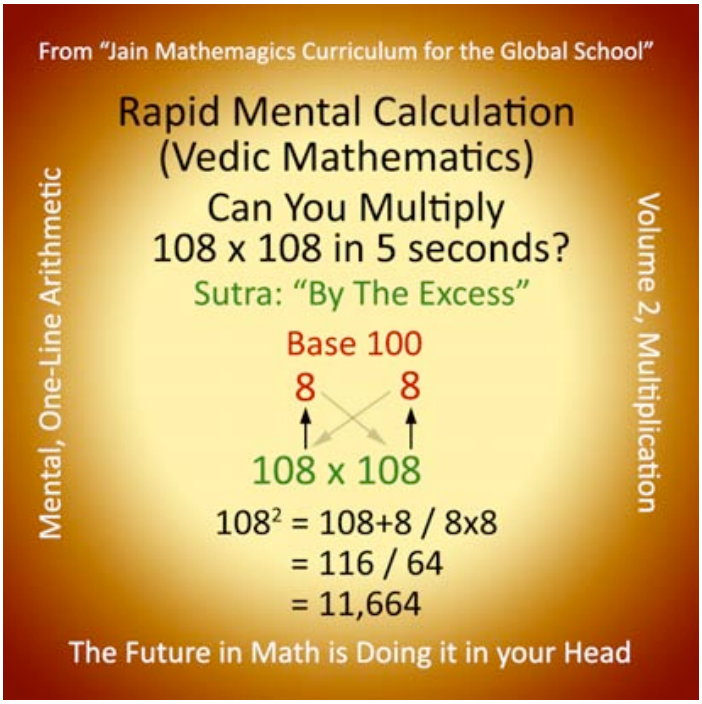
103 + 3
104 + 4

_____
107 / 12

Notice the **Cross Addition** or Diagonal Relationship between these 4 numbers:
103 + 3
104 + 4

(103 + 4) is the same sum as (104 + 3). Both sums = 107.
This phenomenon, observed by the Indian Yogis 2,000 years ago,
is the **Origin of the Multiplication symbol "X"**.
It is shown in the example below, this "X-Shape" in 108^2.

EXAMPLE: 108 x 108



To explain this, let us look at the example of 108 x 108. Since the nearest base is Base 100, which has 2 zeroes, we are required to have 2 spaces or 2 digits after the forward slash, the setting out would be like this:

108 x 108 = _____ / ___ ___

This understanding will lead the student to doing calculations at the Speed of Thought.

Observe the diagonal relationship of the numbers 108 and their excess, something that is not considered or is missing in the western stream of thought.

EXAMPLE 113 x 114 in Base 100
Involving the Carry-Over

My Base is 100, so the predictable pattern to be visualized is:
"something, with 2 digits on the Right Hand Side":
_____ / __ __

= 114 + 13 / 13 x 14
= 127 / $_1$82 (Notice "the Baby One", which will get carried over to the LHS)
= 127 + 1 / 82
= 128 / 82
= 12,882

Here it is again in its written format, but remember to first master the above technique, then adopt this written method as a second choice.

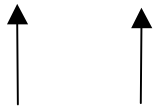
113 + 13
114 + 14

_____
127 / 182 But we are only allowed 2 digits on the RHS, since our Base 1**00** has 2 zeroes in it, so we must slide the 1 of the **1**82 over to the LHS.

= 127 + 1 / 82
= 128 / 82
= 12,882

EXAMPLE 1,003 x 1,004 in Base 1,000

3 4



1,003 x 1,004 = _____ / ___ ___ ___

= 1,003 + 4 / 3 x 4
= 1,007 / __ 1 2
= 1,007 / 0 1 2
= **1,007,012**

EXERCISE 6D

Multiply the following numbers using Base 100 and a couple with higher bases:

a) **104 x 106 =**

b) **105 X 107 =**

c) **108 X 109 =**

d) **112 x 112 =**

e) **111 x 134 =**

f) **112 x 117 =**

g) **114 x 115 =**

h) **102 x 104 =**

i) **101 x 108 =**

j) **1,008 x 1,009 =**

k) **1,011 x 1,025 =**

l) **10,008 x 10,008 =**

ANSWERS to Exercise 6D

a) **104 x 106** = 106 + 4 / 6 x 4 = 110/24 = 11,024
(nb: As a good mental habit, when considering the 2 excesses: 4 and 6, it is easier to add the smaller excess to the other number, even though both "cross additions" have the same sum: ie, both 104 + 6 is the same as 106 + 4)

b) **105 X 107** = 107 + 5 / 7 x 5 = 112/35 = 11,235

c) **108 X 109** = 109 + 8 / 9 x 8 = 117/72 = 11,772

d) **112 x 112** = 112 + 12 / 12 x 12 = $124/_{1}44$ = 125/44 = 12,544

e) **111 x 134** = 134 + 11 / 34 x 11 = 145/3/3+4/4 = $145/_{3}74$ = 148/74 = 14,874

f) **112 x 117** = 117 + 12 / 17 x 12 = 129 / 17+2/7x2 = 129 / $19/_{1}4$ = $129/_{2}04$ = 131/04 = 13,104

g) **114 x 115** = 115 + 14 / 15 x 14 = 129 / 15+4/5x4 = 129 / $19/_{2}0$ = $129/_{2}10$ = 131/10 = 13,110

h) **102 x 104** = 104 + 2 / 4 x 2 = 106/_8 = 10,608

i) **101 x 108** = 108 + 1 / 8 x 1 = 109/_8 = 10,908

j) **1,008 x 1,009** = 1,008 + 9 / 8 x 9 = 1,017/_72 = 1,017,072

k) **1,011 x 1,025** = 1,011 + 25 / 11 x 25 = 1,036/275 = 1,036,275

l) **10,008 x 10,008** = 10,008 + 8 / _ _ 8x8
nb: we are in Base 10,000 which has 4 zeroes,
so we are required to have 4 digits on the right hand side of the forward slash.
= 10,016/_ _ 6 4
= 10,016/0064
= 100,160,064

(Art by Jain, 1990)

LESSON 7

Sutra: "BY ONE MORE"
- Cognate Numbers
- Squaring of Numbers Ending in 5

Lesson 7
Synopsis or Summary of the Lesson

1 – Sutra: "By One More"
shortened from "By One More Than The Penultimate Digit"
or "By One More Than The Previous Digit"

2 – Cognate Numbers eg: 23 x 27 and 44 x 46.
("Cognate" meaning: Related To By Birth)
Two Conditions: When the First Digits are the same, and the sum of the 2 last digits sum to 10, then speed maths can apply.
– Bharati Krsna Tirthaji

3 – Squaring of Numbers Ending in 5
eg: 15 x 15

Sutra: "BY ONE MORE"
COGNATE NUMBERS

When Bharati Krsna Tirthaji wrote his book VEDIC MATHEMATICS he used words that most English speaking-people do not understand, having learnt a strict British system due to England's control of India at that time.
He skillfully introduced another concept of "COGNATE NUMBERS" to best describe the short-cut to SQUARING NUMBERS THAT END In FIVE:
(eg: 15 Squared = 1 x 2 / 5 x 5 =2/**25** based on the Sutra: By One More Than The Penultimate Digit, [which used another big word that forced the English reader to pull out their Dictionary]). He wanted to explain why each time we squared a number ending in 5, like 25 squared = 6/**25**, and 35 squared = 12/**25** that the answer always ended in 25.
By Definition, "Cognate" means "**related to by Birth**". What this means is that there is a special hidden pattern in the answer to the multiplication of two-digit numbers, like
13 x 17, 24 x 26, 32 x 38, 46 x 44, 25 x 25 etc. Have a look at them again in this chart below:

1 3 x **1 7**	**2 4** x **2 6**	**3 2** x **3 8**	**4 6** x **4 4**	**2 5** x **2 5**
Can you see any patterning in those number pairs?				

Look at these answers and determine for yourself the special short-cut that allows you to multiply all these numbers within seconds!
If you look closely you will observe that all the digits in the tens columns are the same.
Notice that in the example above,
24 x **2**6 both the highlighted numbers are the same. When also another condition is fulfilled, instant calculations can then happen, and that is when the both the numbers in the units column have a sum of 10, as in the same example 2**4** x 2**6**, both the highlighted numbers **4** and **6** have a sum of 10.
Thus 24 x 26 are Cognate Numbers in the sense that they are related to one another by their sameness of their digits in the Tens Column, and the sum of their digits in the Units Column both being 10.
When we have determined this factor we are able to perform Rapid Mental One-Line Calculations.

EXAMPLE 24 x 26

24 x 26 = 2x3 / 4x6 = 6 / 24 = 624

How did we get this answer so fast?
Since the "2" is common to both numbers, we apply the vedic sutra: "By One More" and say, I multiply this "2" by the next consecutive or counting number. Since 2 is followed by 3 in the natural order of counting numbers, we immediately say 2 x 3 which gives us the first half of the answer: 2x3 = 6 but we say 600 and something. We then add to this, the multiplication of the numbers that had a complement or sum of 10, saying 4 x 6 = 24. Thus the answer is 600 + 24 = 624.

EXERCISE 7A

Calculate, mentally, the following,
and also write out the One-Line Solution as shown for the example of 13 x 17:

eg:	13 x 17	=	1 x 2 / 3 x 7	= 2 / 21	= 221
a)	12 x 18	=			
b)	27 x 23	=			
c)	36 x 34	=			
d)	49 x 41	=			
e)	55 x 55	=			
f)	68 x 62	=			
g)	74 x 76	=			
h)	81 x 89	=			
i)	97 x 93	=			
j)	106 x 104	=			
k)	117 x 113	=			
l)	125 x 125	=			
m)	135 x 135	=			

ANSWERS to Exercise 7A

a)	12 x 18	=	1x2 / 2x8 = 2/16 = 216
b)	27 x 23	=	2x3 / 7x3 = 6/21 = 621
c)	36 x 34	=	3x4 / 6x4 = 12/24 = 1,224
d)	49 x 41	=	4x5 / 9x1 = 20/09 = 2,009
e)	55 x 55	=	55 x 55 = 5x6 / 5x5 = 30/25 = 3,025
f)	68 x 62	=	6x7 / 8x2 = 42/16 = 4,216
g)	74 x 76	=	74 x 76 = 7x8 / 4x6 = 56/24 = 5,624
h)	81 x 89	=	8x9 / 1x9 = 72/09 = 7,209
i)	97 x 93	=	9x10 / 7x3 = 90/21 = 9,021
j)	106 x 104	=	10x11 / 6x4 = 110/24 = 11,024
k)	117 x 113	=	11x12 / 7x3 = 132/21 = 13,221
l)	125 x 125	=	12x13 / 5x5 = 156/25 = 15,625

Sutra: "BY ONE MORE"
The SQUARING OF NUMBERS ENDING in 5

"Ekadikena Purvena" Sutra: "By One More Than The Previous Digit"

The following Exercise is an extension of Cognate Numbers.
This is a lesson based on focusing on the Previous Digits or Penultimate Digits or those "in the shadow of" that led to the coining of the ancient revelation or Sutra now known as: BY ONE MORE THAN THE PENULTIMATE DIGIT which simplified to: BY ONE MORE THAN THE PREVIOUS DIGIT which contracted to the most widely used title of: **BY ONE MORE**. The Sanskrit title for this is called: "Ekadikena Purvena".

EXAMPLE 15 x 15 or 15 SQUARED or 15^2

We are not concerned with the last digits, as we already know, from cognate number theory that all the answers will end in 25. Our focus is only on the Previous Digit that is the 1 in **1**5 x **1**5 and we will multiply this by the next consecutive or sequential counting number which is 2, and tag on the 25, which gives the final answer:

15 x 15 = 1 x 2 / 5 x 5 = 2/25 = 225

EXERCISE 7B

In the same format as the first example, solve these multiplications:
nb: every answer will end in "**25**"

eg: 15 x 15 = 1 x 2 / 5 x 5 = 2/25 = 225

a) 25 x 25 =

b) 35 x 35 =

c) 45 x 45 =

d) 55 x 55 =

e) 65 x 65 =

f) 75 x 75 =

g) 85 x 85 =

h) 95 x 95 =

I) 105 x 105 =

j) 115 x 115 =

k) 125 x 125 =

l) 135 x 135 =

ANSWERS to Exercise 7B

a) 25 x 25 = 2x3 / 5x5 = 6/25 = 625 **b)** 35 x 35 = 3x4 / 5x5 = 12/25 = 1,225
c) 45 x 45 = 4x5 /5x5 = 20/25 = 2,025 **d)** 55 x 55 = 5x6 / 5x5 = 30/25 = 3,025
e) 65 x 65 = 6x7 / 5x5 = 42/25 = 4,225 **f)** 75 x 75 = 7x8 / 5x5 = 56/25 = 5,625
g) 85 x 85 = 8x9 / 5x5 = 72/25 = 7,225 **h)** 95 x 95 = 9x10 / 5x5 = 90/25 = 9,025
i) 105 x 105 = 10/5 x 10/5 = 10x11 / 5x5 = 110/25 = 11,025
j) 115 x 115 = 11/5 x 11/5 = 11x12 / 5x5 = 132/25 = 13,225
k) 125 x 125 = 12/5 x 12/5 = 12x13 / 5x5 = 12 + 3 / 2 x 3 / 25 = 15 / 6 / 25 = 15,625
l) 135 x 135 = 13/5 x 13/5 = 13x14 / 5x5 = 13 + 4 / 3 x 4 / 25 = 17 /12 / 25 = 18/2/25 = 18,225
(For the last 3 examples, you can use both "By The Excess" as shown, or Magic Teens).

LESSON 8

Sutra: "VERTICALLY and CROSSWISE" For Multiplication of any 2 digit numbers under 100. eg: 23 x 81

+

The Arab's "GELOSIA" Multiplication eg: 23 x 364

Lesson 8
Synopsis or Summary of the Lesson

1 – Origin of the Multiplication Symbol

2 – Cross-Over of the Optical Nerves

3 – Maharishi Mahesh Yogi: the16 Vedic Sutras are Processes of the Mind

4 – Cross-Multiplication. Where in Nature does the "X-Shape" appear?

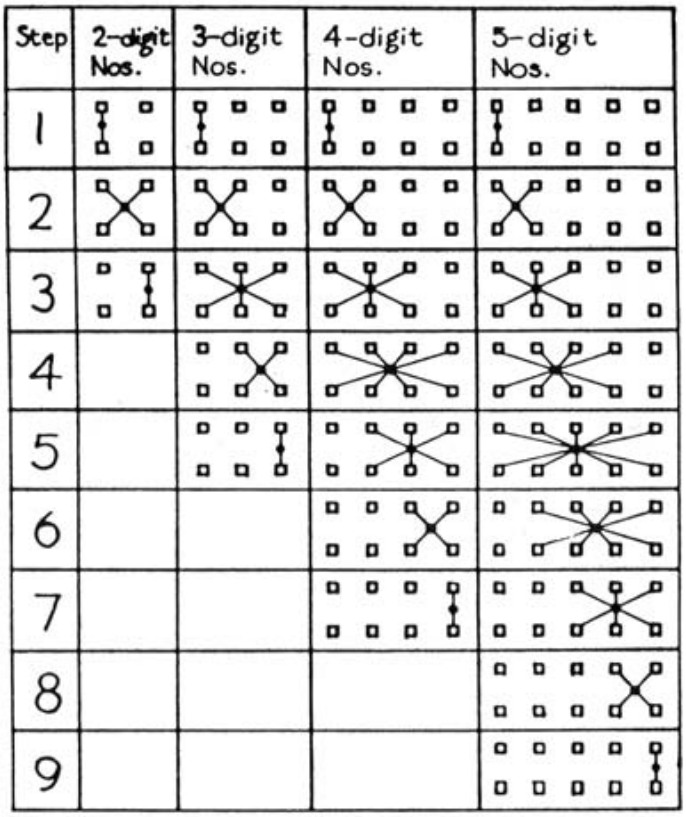
5 – Sutra: "Vertically & Crosswise": the Universal Sutra, the most generally used for all types of Multiplication, for 2-Digit numbers not near an easy base. Right Brain, Feminine Mathematics: using a picture to calculate one-line answers.

6 – Examples with No Carry-Overs like 21 x 32
– Examples with Carry-Overs like 24 x 86

7 – Multiplication of 25 x 25 can be performed by using 4 various or different sutra

8 – Gelosia (Lattice Multiplication) used by the Arbas

Sutra: **Vertically and Crosswise**



(Diagram is taken from: "**Maths or Magic**" by **Joseph Howse** who wrote a small booklet on Vedic Mathematics in the 1970s).

Notice how this array of Multiplications from ancient Bharat or India appears to resemble some Star Code or Language. This is how Multiplication was always done.
In fact, the very **origin of the Multiplication symbol**, when we write say

12 **x**
34

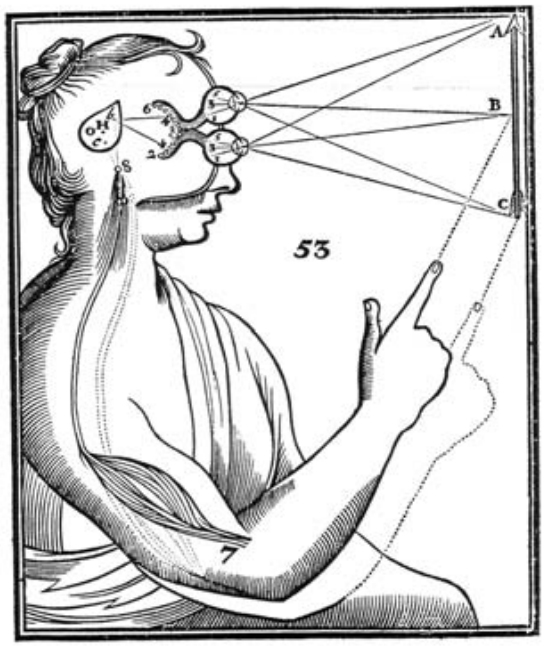
originates from this Sutra called Vertically and Crosswise. It is a memory of the diagonal relationships of those 4 digits, when we cross multiply (1x4) + (2x3).

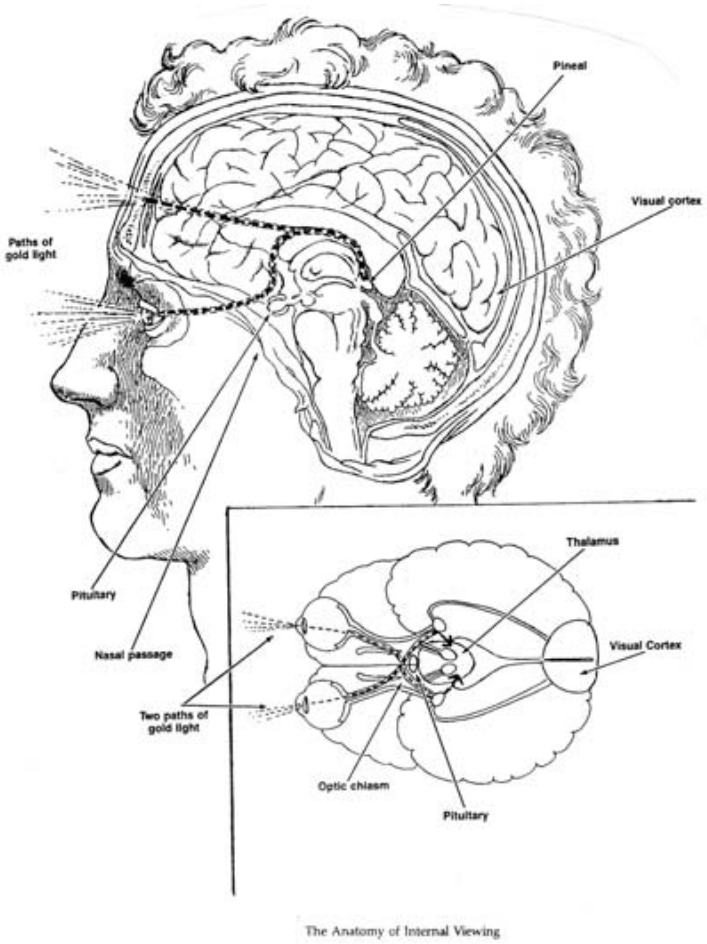
This highly sophisticated form of Vedic Mathematics was practiced by the Aryans of the Upper Indus Basin some time before 1,000 BC. Some techniques were transmitted to Europe through the Arabs at the Court of Baghdad in 770 AD, to become the basis of much European mathematics. But more never got through, and it remained for the pope Shankar-archarya of Govardhana-Puri (ie: Swami Bharati Tirthaji 1884-1960) to rediscover the complete system of India through intensive study of certain Vedic texts.

"The true honour of the invention of Zero, the decimal point and the place value system, and the concept of negative numbers all belong to Hindu roots, without which we would have no modern computers nor technology!"
Jain 108

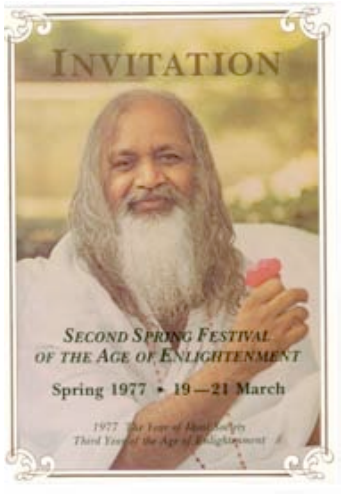
DEVELOPING THE INNER MENTAL SCREEN

The **Cross-Over of the Optical Nerves** resembles closely the Sutra:
Vertically and Crosswise. The Left Eye is connected to the Right Side of the Brain and the Right Eye is connected to the Left Side of the Brain.





**(Above picture reproduced from Barbara Brennan's "Hands Of Light"
a medical Intuitive who could describe
the inner organs of the human anatomy via clairvoyance).**

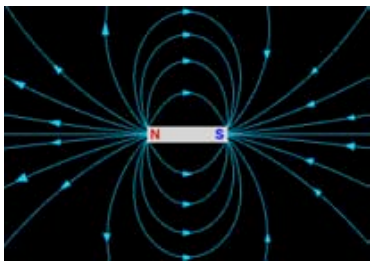


Maharishi Mahesh Yogi states that the 16 Vedic Sutras are Processes of the Mind and invites students to meditate upon the deeper meaning of these Sutras.

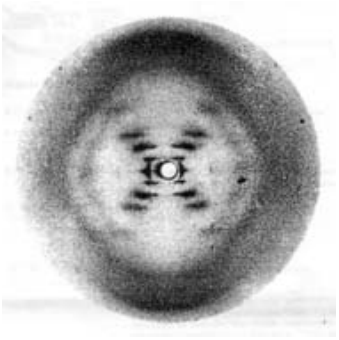
The Sutra here: Vertically & Crosswise, is essentially a cross-like symbol, so Maharishi would ask you to explore this "X-Factor".

Where else in Nature or Physics does this "X" shape appear.

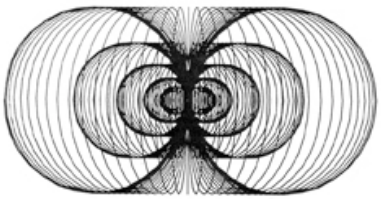
Make a List:



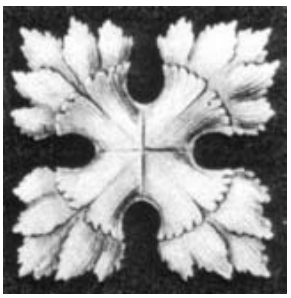
magnetic Field Dipole of a bar magnet



Rosalind Franklin, a woman who first discovered DNA by taking the first radiograph of the DNA molecule, exposed this "X" shape pattern.



(Cross-section of the Tube Torus Donut showing nesting Tori radiating in wavelengths of the Golden Ratio of 1:1.618033 therefore creating an infinite series bridging the Macrocosm to the Microcosm. Notice the "X"-shape or "X"-factor!)



Skeleton of the Horny Coral

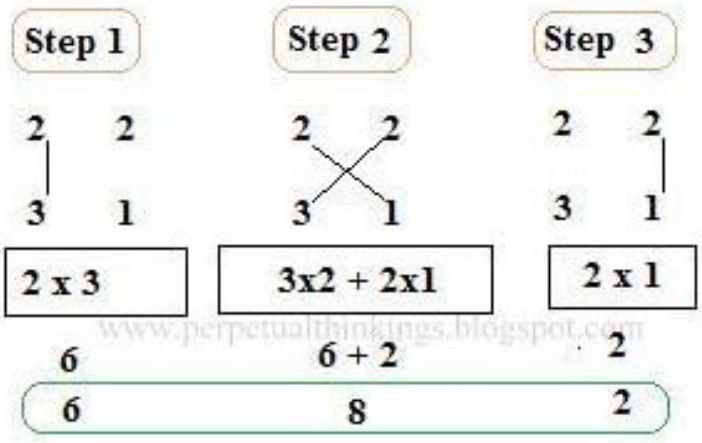
Sutra: "VERTICALLY and CROSSWISE"
Aka "Urdhva-Tiryak" in Sanskrit

This is the UNIVERSAL SUTRA for all TYPES of MULTIPLICATION, especially when the NUMBERS are NOT NEAR an EASY BASE.
eg: 18 x 92. The Master BKT said that of all the 16 sutras, this particular one is the most universally or generally used).

EXAMPLE 12 x 13 and 22 x 31 Involving No Carry-Overs

1 2 X 1 3 _____ 1x1 / (1x3) + (1x2) / 2x3 = 1 / 3 + 2 / 6 = 1/5/6 = 156	If you were to do this mentally, the mental working out would be like this: "I multiply vertically on the right which is 2x3=6, then for the central section, I cross-multiply the two diagonals which gives 1x3 and 1x2 which gives 3 and 2, so I add them giving me 3+2=5, then for the extreme LHS digit, I multiply vertically on the left which gives 1x1=1. This gives me my Mental, One-Line Answer of **1/5/6**". nb: This Sutra is Ambidextrous in the sense that you can choose to calculate from the RHS, as in the case above, or do it from the LHS. In India, most children do it from the LHS, but I find here in the west, that children prefer to do it from the RHS and working back to the LHS. It is your choice.

22 x 31



An Example Involving the Use of a Carry-Over

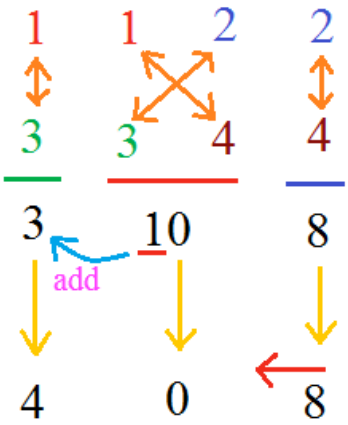
nb: This Sutra is generally performed mentally, so what follows is merely the written form of the mental form. You are only practicing the written form until you are able to master this Sutra via mental powers alone.

EXAMPLE 13 x 14 Example Involving A Carry-Over

1 3 x **1 4** 1 7 2 1 1 8 2	The mental working out would be: "I multiply vertically on the RHS which is 3x4=12 or 3x4=$_1$2. I put down the "2" on the first row and carry over the "baby 1" in the second row. I make sure that I place this "baby 1" directly under the next future position which is the cross-multiplication of the 1x4 and 1x3=4+3=7. I need to add this "baby 1" to the 7 obtained, thus 7+1=8, I put down the "8" then multiply vertically on the LHS which is 1x1=1, forming my answer of 182.

12 x 34

1 2
x 3 4
4 0 8



12x34=408

Origin of the "X" symbol

The beauty of this Sutra is that it is the Universal One, the one that is most generally applied, and solves all forms of multiplication. Remember in the previous chapter when we used the Nikhilam Sutra which is about multiplying numbers above or below an easy base, like 13 x 14, which are both near the Base of 10, we would use the Nikhilam Sutra and apply the Sutra: "By The Excess". But what happens when the two numbers being multiplied are not near an easy common base, eg: the numbers 12 x 34. We have arrived at a universal principle, a way of calculating by understanding this "X-Factor".

1 2
X
3 4

The Cross-Multiplication of the above example 12 x 34 is the sum of 1x4 + 2x3 giving 4+6 = 10. When you consider this relationship of those 4 digits, how they are related to one another by these 2 diagonals, it forms a cross, or an "X". The deep inspiration here is that have you ever wondered why you use this symbol "X" for multiplication. Because it is derived from this original Sutra called Vertically and Crosswise. This means that our ancient vedic seers, our forbears knew this intimate relationship between numbers and naturally adopted this symbol: "X".

The Multiplication of 25 x 25 can be performed by using 4 various or different sutras!

Some calculations give you a choice of several sutras to use in some cases, like the example of **25 x 25**. This could be solved be using either 4 sutras or methods, thus your challenge of being a smart vedic mathematician is knowing quickly which sutra to use, in the your full bag of mathematical tricks.

1- "Vertically and Crosswise", takes about 10 seconds to calculate mentally. This sutra applies the diagonal relationships of the 4 digits in the 2digit x 2 digit forming a cross-like solution. Or

2- "By The Excess" (Using Base 20 = 2x[25+5] / 5x5 = $60/_{2}5$ =625), which takes about 8 seconds to multiply. In this workbook, you have not yet learnt Base 20, this will appear in your next level of learning. Or

3- "Transpose & Apply" (Using the fact that 25 is 100÷4). Begin by multiplying 25 by 100 which is 2,500 then divide this by 4 giving 625. This takes about 10 seconds to calculate mentally.

4- "By One More" (Using (2x3/5x5 = 6/25). This Sutra is the quickest and therefore the best choice of the 4 Sutras to use. It takes only 1 second to calculate this answer using this special formula. So your task is to get familiar with all the Sutras and quickly establish which formula is the best choice. This comes with practice.

EXERCISE 8A

Multiply the following 2 Digit by 2 Digit numbers, using the sutra: Vertically and Crosswise:			
a)- **1 4 x 1 7** ----------	b)- **2 1 x 3 4** ----------	c) **3 3 x 6 6** ----------	d)- **4 2 x 6 5** ----------
e)- **5 8 x 7 2** ----------	f)- **6 4 x 9 1** ----------	g)- **7 6 x 8 4** ----------	h)- **8 5 x 4 3** ----------

When introducing this sutra to younger children first encountering this style, give them only numbers from 1 to 5, like 21x53 or 33 x 24 etc so the cross-multiplications are easy to perform.

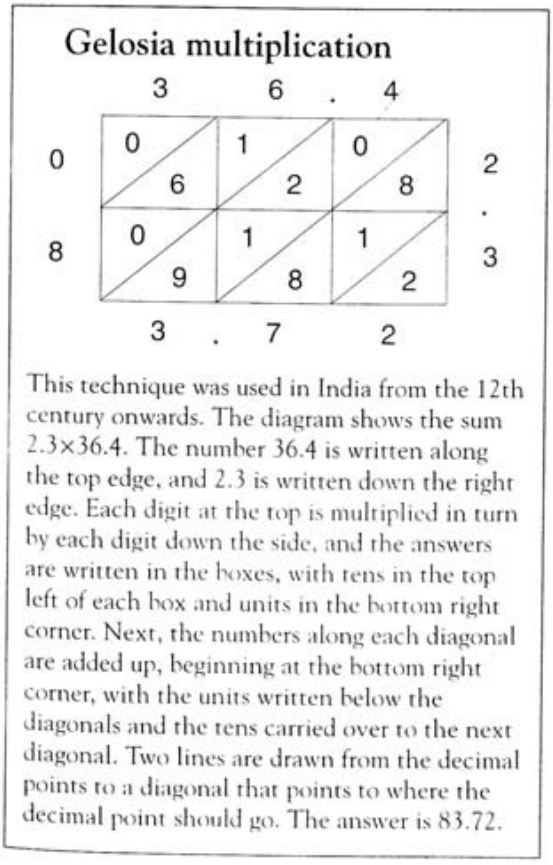
ANSWERS to Exercise 8A

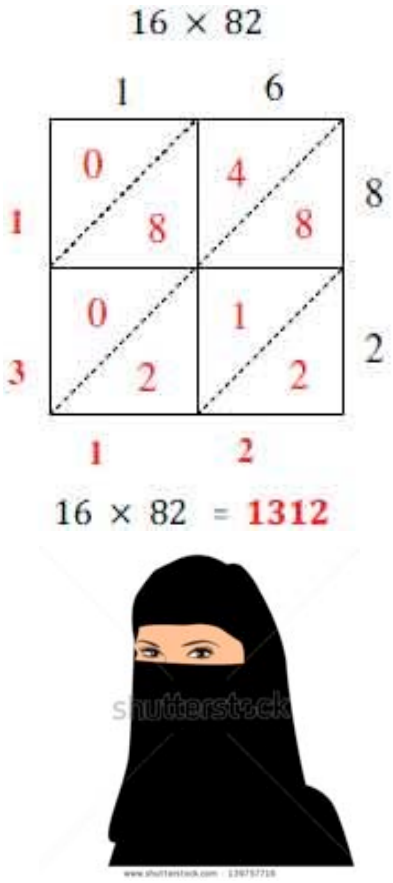
a) 14 x 17 = 1x1/(1x7)+(4x1)/4x7 = 1/11/28 = 1/13/8 = 2/3/8 = 238
b) 21 x 34 = 2x3/(2x4)+(1x3)/1x4 = 6/11/4 = 7/1/4 =714
c) 33 x 66 = 3x6/(3x6)+(3x6)/3x6 = 18/36/18 = 18/37/8 = 21/7/8 = 2,178
d) 42 x 65 = 4x6/(4x5)+(2x6)/2x5 = 24/32/10 = 24/33/0 = 27/3/0 = 2,730
e) 58 x 72 = 5x7/(5x2)+(8x7)/8x2 = 35/66/16 = 35/67/6 = 41/7/6 = 4,176
f) 64 x 91 = 6x9/(6x1)+(4x9)/4x1 = 54/42/4 = 58/2/4 = 5,824
g) 76 x 84 = 7x8/(7x4)+(6x8)/6x4 = 56/76/24 =56/78/4 = 63/8/4 = 6,384
h) 85 x 43 = 8x4/(8x3)+(5x4)/5x3 = 32/44/15 = 32/45/5 = 36/5/5 = 3,655

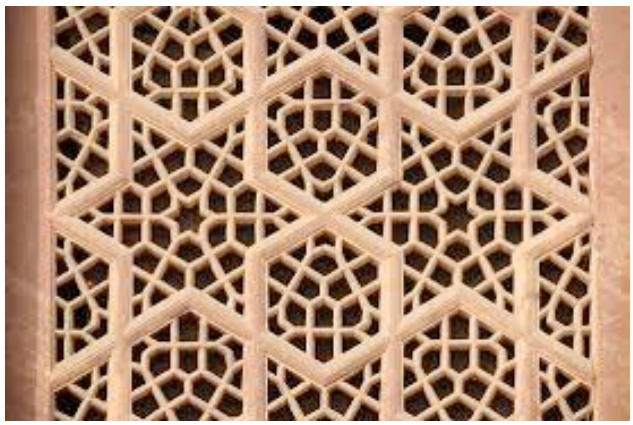
GELOSIA MULTIPLICATION (Lattice Multiplication)

HOW DID THE ARABS PERFORM THEIR MULTIPLICATIONS? (Multiplication of 2 Digits By 2 Digit Numbers)

This is how the Arabs were doing clumsy and complex multiplication, at the same time when the Hindus were doing it effortlessly in their head!
(The origin of the word "Gelosia" is hazy, but some scholars say that it is the Italian word for "Jealousy", as the Shah's or noblemen of Arabia at that time guarded their many wives from the desirous eyes of others by having them safely behind stone carved grills that appear like this latticework shown)





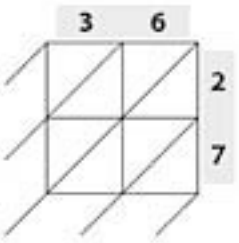


36 x 27 = What?

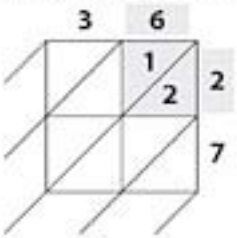
```
  36
x 27
 252
+72
 972
```

The traditional solution at left gives you the same result as a multiplication grid, an alternate way to solve math problems:

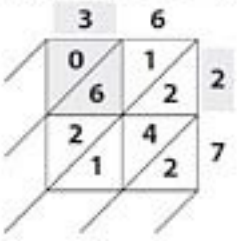
1. Set it up on a grid like this:



2. Since 6 x 2 = 12, insert the "12" in the triangles like this:

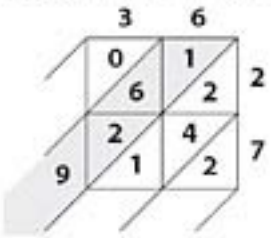


3. Fill out the rest. Use a zero if it's less than 10, as with 3 x 2 = 6:

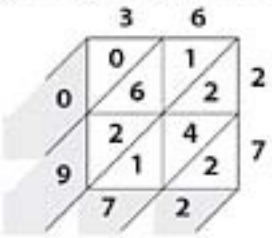


Source: Ivy Hall Elementary School Web site

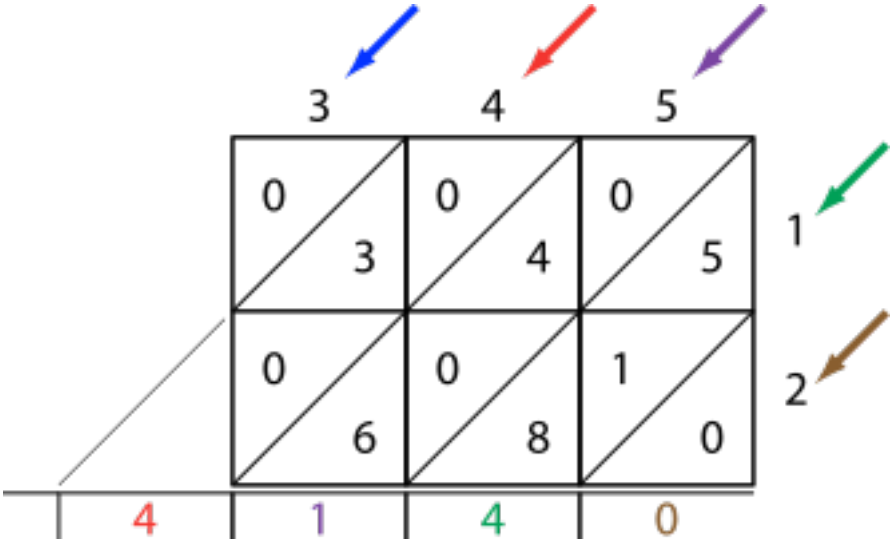
4. Time to think diagonally. Add each column, like 1 + 6 + 2 = 9:



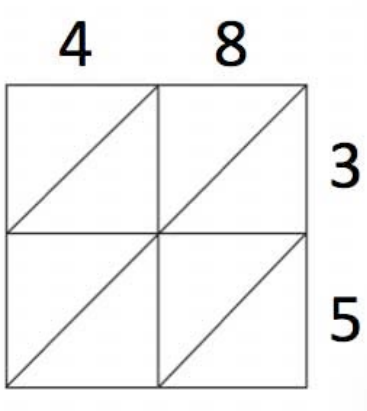
5. Putting those together (0972) gives you the answer: **972**.



Chicago Tribune Chuck Burke



EXERCISE 8B



Can you calculate the Answer to 35 x 48 using the Arabic Gelosia Method?

(see Answer 4 pages ahead).

LESSON 9

P u z z l e s
(Lusus Numerorum)

Lesson 9
Synopsis or Summary of the Lesson

1 – 8 Litre and 5 Litre and 3 Litre Jug

2 – Predicting a Future Answer

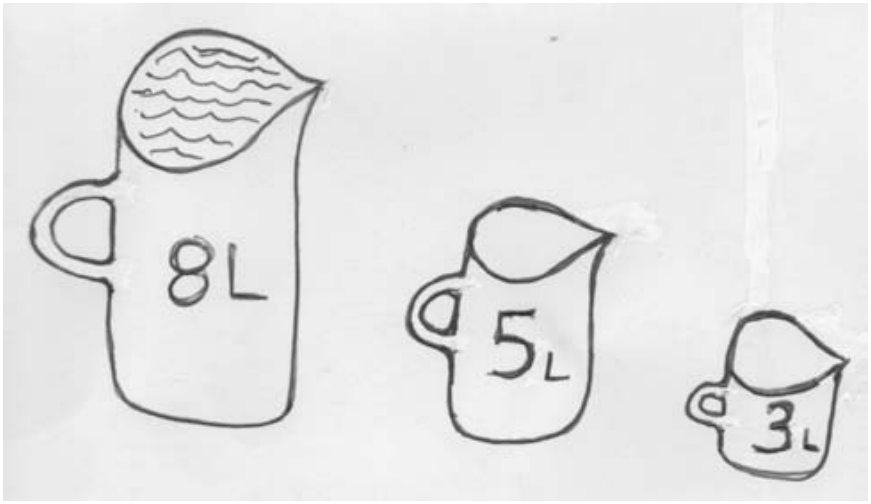
3 – The Anointed Number 6,174

4 – The Hexagon Tile Puzzle

PUZZLE
8 Litre and 5 Litre and 3 Litre JUGS

The 8 Litre Container is full of water. The other 2 are empty.
Using only 3 containers, can you leave the 8L container with exactly 4L in it?
(**hint**: flat-disc-counters may be helpful).
nb: for abbreviation purposes "**8L**" = 8 Litres and "**8LJ**" = 8 Litres Jug

8L and 5L and 3L JUGS



SOLUTION

There are 7 steps to this solution.
Also, there may be other solutions than this one given.

Step 1 – From the 8LJ pour 3 into the empty 3LJ, leaving 5L in the 8LJ.

Step 2 – From the 3 LJ pour all 3L into the 5LJ.

Step 3 – From the 8LJ pour 3 of the 5L into the 3LJ leaving 2L in the 8LJ.

Step 4 – From the full 3LJ pour 2L into the 5LJ to fill it up, leaving 1L in the 3LJ.

Step 5 – From the 5LJ pour all 5L to the 8LJ making 7L in the 8LJ, and 0 in the 5LJ.

Step 6 – From the 3LJ pour the 1L of the 3LJ to the 5LJ, leaving 0 in the 3LJ and 1 in the 5LJ.

Step 7 – From the 8LJ pour 3L into the empty 3LJ which leaves 4L remaining in the 8LJ, as requested.

P U Z Z L E
Predicting A Future Answer! (2 pages)

Here is a special trick that I use at the beginning of my Vedic Mathematics seminars, to teach the audience about Pattern Recognition.
This is a truly amazing addition of numbers, but it is really quite simple. We are going to add a set of 5 numbers, and each number must be 3 digits.
I first ask anyone in the audience for a 3 digit number.
Of the 5 sets of 3 digits numbers that will be totaled or added, the audience will give me 3 of them and I will give 2 of them.
As soon as someone gives the first 3 digit number, I immediately give them the future answer!
There are **2 conditions**:

1- The audience must give a random number from 100 to 900.

2- There can be no triply repeating digits like 111 or 222 known as Rep Digits.

The setting out would look like this:
Supposing the first number given was 123:

Audience: **1 2 3**
– – –
– – –
– – –
– – –
2, 1 2 1

This seems quite fantastic, that I have already given the final future answer being 2,121.
Next, I ask the same person to call out the next 3 digit number. Suppose he or she says the number 456, I immediately give the next set of 3 digits which will be 543.
They then give another 3 digit number. Suppose it is 396, then I write down 603.
Again, the full working out would like this:

Audience: 1 2 3
4 5 6
5 4 3
3 9 6
6 0 3
2,1 2 1

The audience then add up these five numbers and are amazed to discover that it does sum 2,121. And it only took me 1 second of time to determine this Magic Total.

THE HIDDEN PATTERN:
Firstly, given the first 3 digit numbers, like 123, how did I arrive at the final sum of 2,121?
From their number, "123" I immediately place a "2" in front of the number to get 2,123, but I need to subtract from this the number "2". I will explain in a minute why two must be subtracted from this total.
Secondly, as soon as I am given the second and fourth numbers, I take the complement of 9 from the numbers to arrive at the numbers I have given in the third and fifth placements.

eg: when they give the number 456 I subtract these 3 digits from 9,
(9-4 / 9-5 / 9-6) to get 543.

eg: when they give the number 396 I subtract these 3 digits from 9,
(9-3 / 9-9 / 9-6) to get 603.

These three lots of 9s ie: **999**, can be thought of as (1,000 – 1).
Thirdly, with this (1,000 – 1) in mind, you can view the new setting out to understand now why we place a "2" in front of the number "123" to get 2,123:

$$\begin{array}{r} 123 \\ 1{,}000 - 1 \\ \underline{1{,}000 - 1} \\ 2{,}123 - 2 \end{array}$$

And this explains also why we need to subtract two from the number in the Units Column in the 2,123 position. The solution is based on (**2,000 – 2**).

This Puzzle is a great lesson in getting the student to get up in front of the class and repeat these steps. It develops **Memory Power** and **Mathematical Confidence**.

The purpose of this **Lusus Numerorum** (Latin for "**Number Jest**") is to get the audience to start thinking in terms of Mental Calculation, and not relying on the Electronic Calculator. It will give them an appreciation of Number Magic, and introduce them to many other examples like this that do exist and are part of our mathematical heritage from our ancestors.

PUZZLE
The ANOINTED NUMBER 6,174 (1 page)

THE ANOINTED NUMBER
6,174

LUSUS NUMERORUM
(Latin word for :"Number Jest")

Ask 3 students to approach the black or white board to simultaneously apply the following rules to any randomly picked 4 digit number.

7,125	**1,234**	**4,096**

Rules:

- Pick any 4 digit number at random.
- Rearrange the digits to form the largest and smallest digits.
- Subtract the smaller from the larger.
- Repeat the first 2 steps with the answer until you have accomplished 3 distinct lines of working out, as shown below

Eg: 7,125	**Eg: 1,324**	**Eg: 4,096**
7,521 – 1,257 = 6,264	4,321 – 1,234 = 3,087	9640 – 0469 = 9171
6,642 – 2,466 = 4,176	8,703 – 0,378 = 8,325	9711 – 1179 = 8532
7,641 – 1,467 = 6,174	8,532 – 2,358 = 6,174	8532 – 2358 = 6174

Ask the students what this quality evokes, whether it appears magical, non-sensical, reveals the underlying and mysterious symmetry in the number world, etc.
An important element in this exercise is
Learning Through Mathematical Discovery.

We intend to get the 3 students at the board witnessing the similarity of their answer, that they all arrived with this Number 6,174.

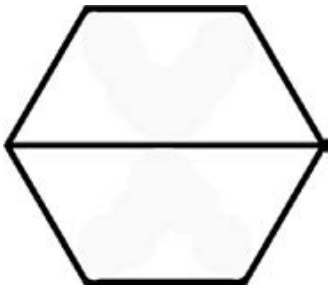
Then you can highlight this Surprise or Discovery, and discuss with the group whatever comes to mind.

HEXAGON PUZZLE:
Using Half Hexagon Tiles! (2 pages)

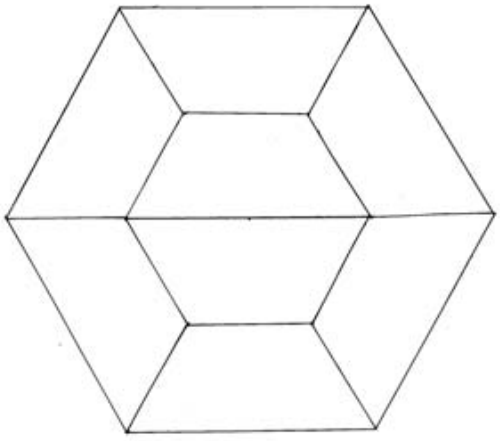
ACTIVITY No. 4
Hexagon Puzzle, using Half Hexagon Tiles:

This puzzle was found in the ICAS Mathematics Paper A (2014) targetted for Year 3 students (for 8 year olds).
(International Competitions and Assessments for Schools (ICAS) test materials).

James has some ceramic tiles that were all the same size and shape. He noticed that when he put 2 of them together, they formed this familiar and regular hexagon shape:



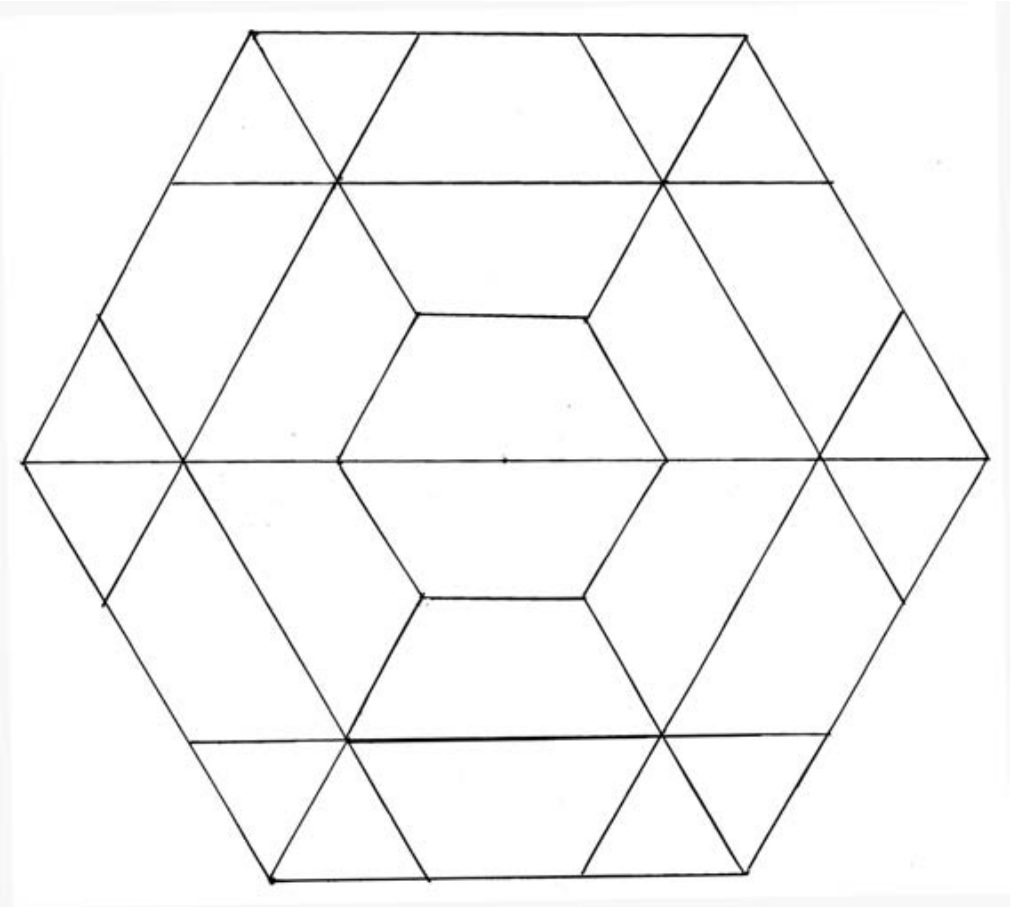
When he placed some more of the same tiles around these 2, he noticed that it formed an even larger regular hexagon shape:



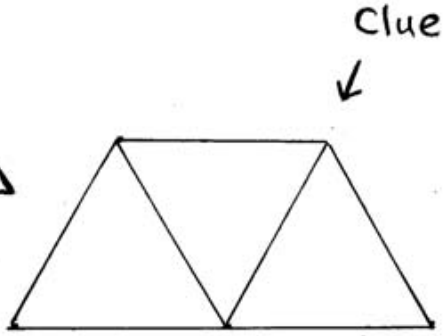
The puzzle is to work out how more tiles does James need to form the next larger regular hexagon shape, as if to add another ring of tiles?

(A) 6
(B) 10
(C) 12
(D) 18

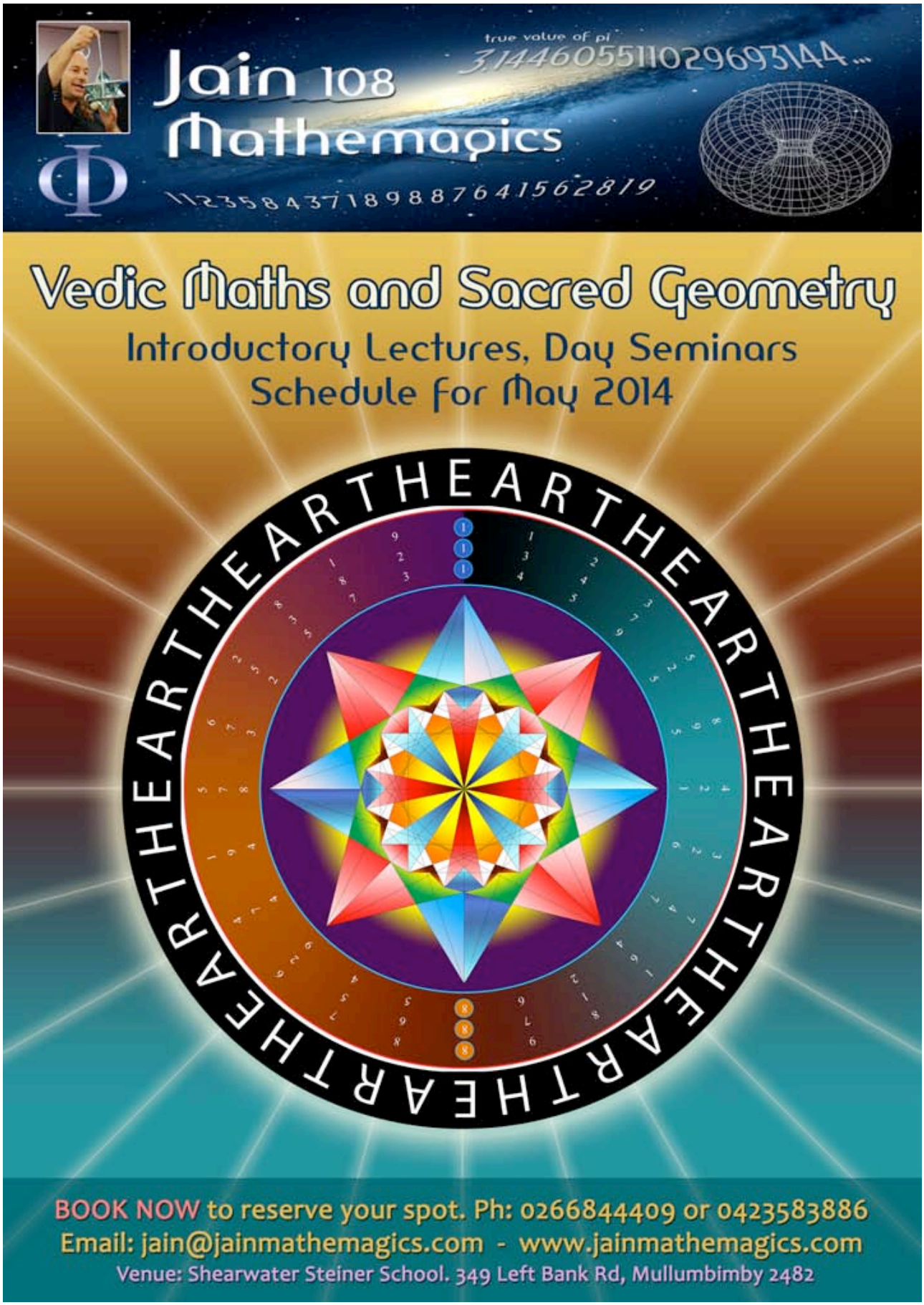
SOLUTION:



Solution to the Hexagon Tile Puzzle. Will need 6 more  tiles + 4 more = 10 (because there are 12 triangle shapes, 3 per tile).



PROMOTIONAL POSTERS



Jain 108 Mathemagics

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Mobile +61 (0) 423 583 886
jain@jainmathemagics.com
www.jainmathemagics.com
PO Box 729, Mullumbimby NSW 2482, Australia

2015 After-School Classes include:

Mathemagics For StarKids (**5 to 8 years old**) Starts Tuesday **3rd Feb, 2015**. 3.30pm to 5.00pm. Limit to 10 students. 8 Tuesdays in Feb-Mar. One Parent to be present. Subject: Sacred Geometry.

Mathemagics For Juniors (**9 to 12 years old**) Starts Wednesday **4th Feb, 2015**. 3.30pm to 5.00pm. Limit to 15 students. 8 Wednesdays in Feb-Mar. One Parent to be present.

Mathemagics For Teens (**13 to 19 years old**). Starts Wednesday **4th Feb, 2015**. 5.30pm to 7.00pm. Limit to 20 students. 8 Wednesdays in Feb-Mar. Adults or Parents are welcome as paid students in this class.

Worksheets for all classes are supplied Some classes will be **Filmed**.

VENUE:
The Living Yoga Sanga, 1st floor, 63 Stuart st, above Mullum Mac in Mullumbimby, 2482, Far North NSW. inland of Byron Bay.

Vedic Maths aka

RAPID MENTAL CALCULATION

Example: 1 of the 16 Sutras:

BY ONE MORE THAN THE PREVIOUS DIGIT.

"SQUARING OF NUMBERS ENDING IN 5"

15 x 15 = 15^2 = 1x2 / 5^2 = 2/25 = 225

25 x 25 = 25^2 = 2x3 / 5^2 = 6/25 = 625

35 x 35 = 35^2 = 3x4 / 5^2 = 12/25 = 1,225

45 x 45 = 45^2 = 4x5 / 5^2 = 20/25 = 2,025

Another Sutra:

DIGITAL COMPRESSION or **Digit Sums**

MULTIPLICATION BY 11 **eg: 11 x 34**

= 3 / 3+4 / 4

= 3 / 7 / 4

= 374

MatheMagics For Starkidz

Bookings are essential.
Class size is limited to 15 students and 15 accompanying parents.
To secure your seat:
Please make your deposit into my
Cheque Account: "Jain 108 Mathemagics"
Bsb: 032573 **Acc**: 308770

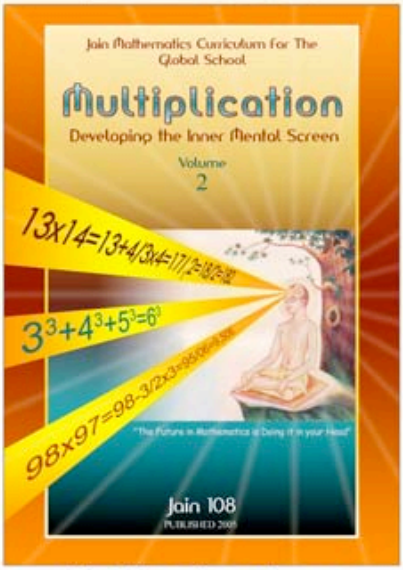
(When you have a made an electronic non-refundable payment, please contact Jain via email that this has been done).

Classes For 2015

6	1	8
7	5	3
2	9	4

VEDIC MATHEMATICS
TERM 1 OF 2015

$25 PER CLASS OR $20 PER CLASS IF ALL 8 CLASSES ARE PREPAID FOR BY MONDAY 26TH JANUARY, 2015.
Classes begin on February 3rd. Mathemagics For Juniors (includes one parent) and Mathemagics for Teens and Adults. Pre-payment of $160 necessary to book your place due to limited seating.
Starkidz will learn Sacred Geometry.



jain@jainmathemagics.com
0266844409 or **0423583886**
www.jainmathemagics.com

Jain is an international lecturer on Sacred Geometry and Vedic Mathematics (Rapid Mental Calculation). He has also taught thousands of children all over Australia and overseas in his program called "**Mathemagics**" that teaches the translation of Number Sequences into Atomic Art.

Jain's **21st CENTURY CURRICULUM** invites You and Your Child to:

- The future in Maths is Doing it in your Head.
- Get involved in your Child's education.
- Learn how to multiply numbers at the Speed of Thought. Develop the Inner Mental Screen.
- Become a Mathematical Genius.
- Improve your Mathematical Confidence.
- Improve your Memory Power.
- Build the Mental Muscle!
- Starkidz will learn Sacred Geometry, the 5 Platonic Solids and the Art of Fractality.
- Translate Numbers Into Art.
- This New Millennium Maths is the emerging Curriculum for the **Earthheart School** or **Sacred Geometry Miniversity**.
- Certificate Accredited Courses each School Term.

WHAT TO BRING: For every lesson, please bring your own pens, A4 book with blank and or lined paper, lead pencils, colour pencils, rulers, erasers, compass (for teens only).

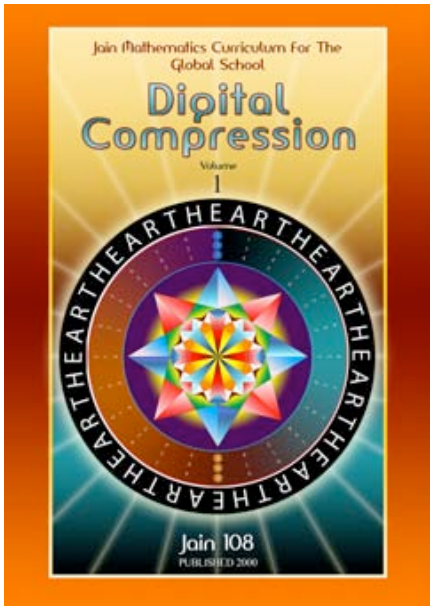
LEARN VEDIC MATHEMATICS + SACRED GEOMETRY with JAIN 108.

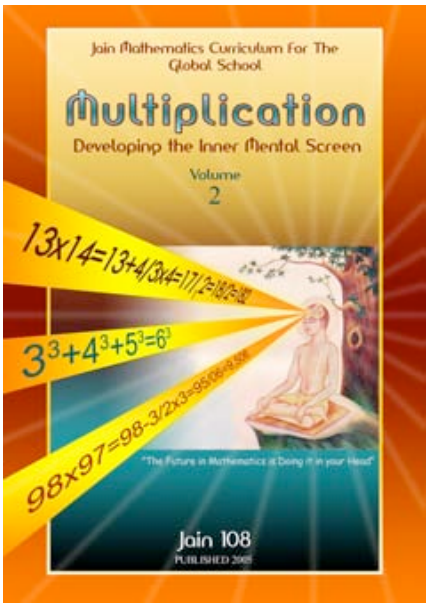
MATHEMAGICS AFTER-SCHOOL CLASSES for CHILDREN and ADULTS

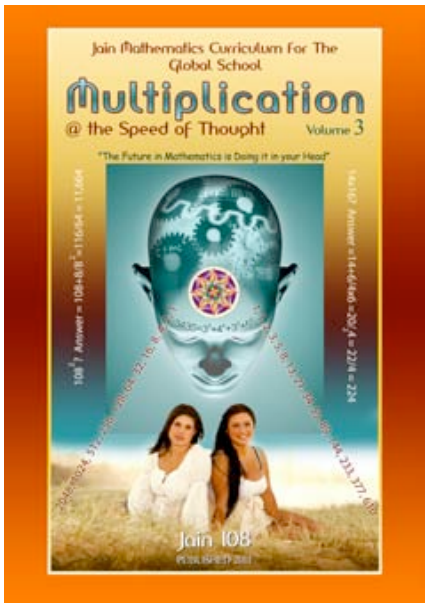
The Future In Maths is Doing It In Your Head!

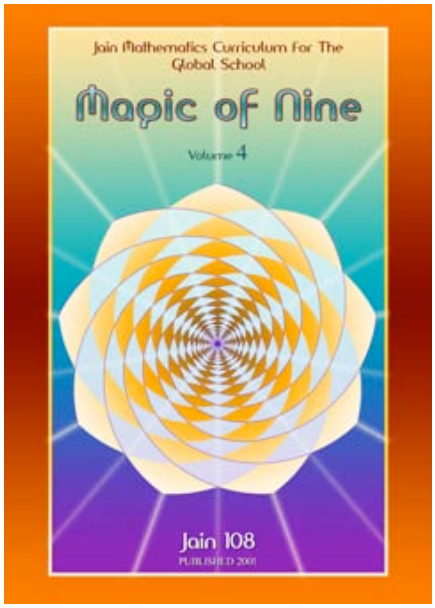
6 Books On Vedic Maths

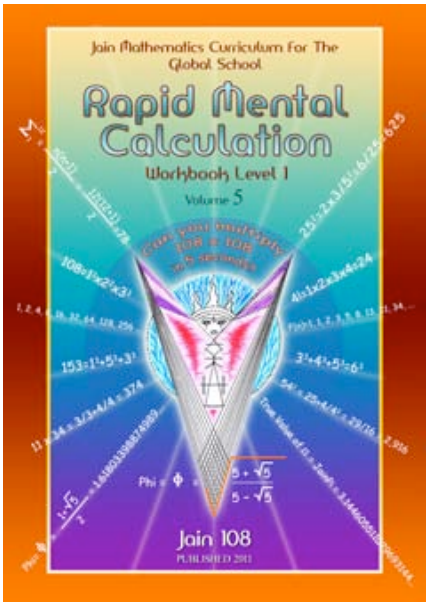
by Jain 108

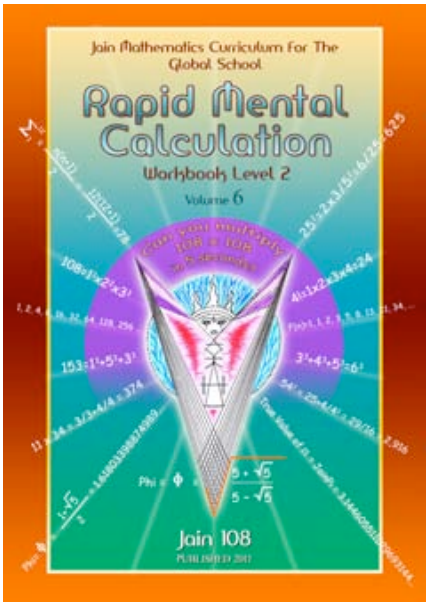






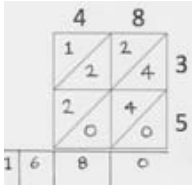






All Books are $50.
This set is also available as ebooks, $33 each.

ANSWER to 8B



48 x 35 = 1,680

Certificate of Completion will be issued
when a student has completed Level 1 and or Level 2

Jain 108 Mathemagics

FEEDBACK SHEET

- Name…….

- What is your Profession?…….

- Date:……

● Name of Seminar(s)		
Mathemagics For Starkidz	Mathemagics For Juniors	Vedic Mathematics For Juniors
Vedic Mathematics for Teens	Divine Phi Proportion	3-Dimensional Geometry
The Art Of Number		Magic Squares

● How would you rate this Seminar? (Please Circle: 1 is low, 10 is excellent)

1 2 3 4 5 6 7 8 9 10

- What did you enjoy most about this Seminar?

- Were there any special moments or peak experiences?

● What criticism or improvement could you recommend to Jain to help in upgrading his next presentation?

- Do you give permission that Jain can use any of the above short feedbacks as a TESTIMONIAL that can posted on Jain's website?
Yes No

- Is there another person who you would like Jain to contact to recommend this course to. I will need their:

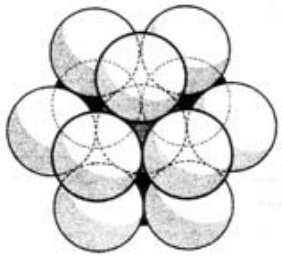
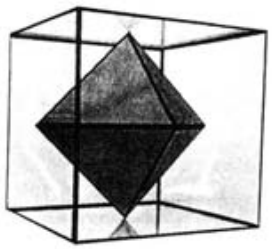
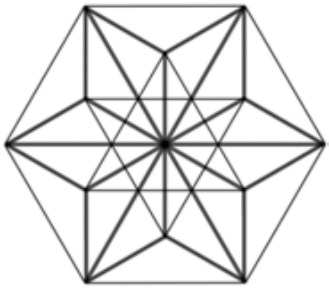
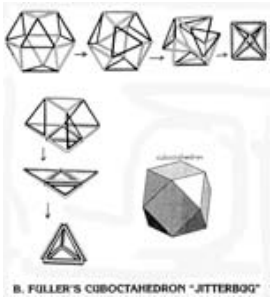
Name: …….. Phone Number: ……

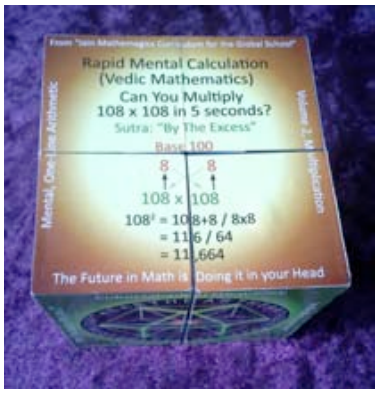
Nearest Main City of Residence: …….

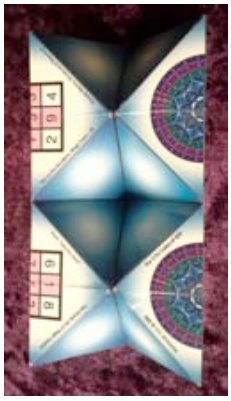
MAGIC DIAMOND

Magnetic Sacred Geometry Toy That Turns Itself Inside-Out

http://www.jainmathemagics.com/product/138/default.asp

		
"The 12 Around the One". This is an ancient puzzle. How many spheres can pack or "sphere-kiss" around a central and same-sized sphere. The answer is 12, meaning that there is a central 13th sphere. When someone like Jesus has some much Love, he or she attracts to them, 12 Disciples. A Universal Law of Magnetism.	Leonardo da Vinci's wooden model of diagram. It has 6 squares, 8 equilateral triangles and 24 edges all of the same unit length. Internally, there are also 24 triangular vectors that meet at the centre. Measurements based on the Square Root of 2(1.4142…). which is essentially cubic and favoured by crystalline structures.	The Octahedron (having 8 Triangles) is the negative space inside the Cube, seen in blue,. It is actually the **Dual of the Cube**, meaning what shape would you get if you joined the 6 Face-Centres of the Cube. The shadow of this Octahedron is the Diamond, thus the evolution of the name: Magic Diamond, as the secret space inside the cube!
		
Cuboctahedron is Fractal, meaning that the inside is the same as the outside: ie: if one of the 12 internal radials going from the centre to a vertex, is a matchstick length, then the outer edge length is the same matchstick size. This is the only shape in the universe that has this fractal behavior. It is therefore a highly balanced system, not just a shape!	Magic Diamond is composed of 6 Outer Faces and 6 Inner Faces, giving 12 possible printing areas. Buckminster Fuller, the father of geodesic domes, called this the Vector Equilibrium or Jitterbug	When made from sticks and rubber cross-joins, this Cuboctahedron Jitterbug or Vector Equilibrium shape-shifts from Icosa (half compression) to Octahedron Diamond, then to Tetrahedron (full compression).
		"I couldn't believe it. I was at a Jain 108 Seminar for Starkidz and Juniors, and the children were all queuing up to have a turn to fold this shape. They were not as interested with any of the other educational toys that Jain displayed on his table, they were fighting over whose turn it was for Magic Diamond, so parents stepped in and supervised 5 minute turns, all day! It was unbelievable, all this fuss. I suggested to Jain that he should get more of these made up, so apparently he has done this and the children can now have their own Shape-shifter." Louise Aylward of Byron Bay, far north NSW.
Genesa Crystal is shown here as 4 Great Circles, in copper rings, to best conduct energy from all levels. It could also be formed from 6 Hexagons at 60 degree angles, thus its numerical code or signature could be likened to 6-6-6-6. Whereas, Cuboctahedron, at each vertex has a triangle, square, triangle square, therefore its numerical code is 3-4-3-4.	One of the 6 Outer Faces. This toy is essential my Business Card or Logo, but provides an attractive and educational experience. Hidden inside are another 6 internal richly illustrated faces, discovered as the child turns the cube into the cuboctahedron aka Magic Diamond.	





"As an adult, I love it as much as the Starkidz, there is something about it, the inner magnetic components make a clicking sound when 2 sides meet. I am enchanted by the ability of this shape to turn itself inside out. Puts me into a very meditative, contemplative state".

Sirli of Mullumbimby, far north NSW.

"I love all the graphics, they appear to be highly psycho-active or coded images with lots of deep mathematical meaning".
Zephyr of Goonengerry, far north NSW.

One of the 12 printable faces

For more knowledge on Sacred Geometry,
visit and like my **Facebook Business Page**, search for:
"**Jain 108 Mathemagics**"

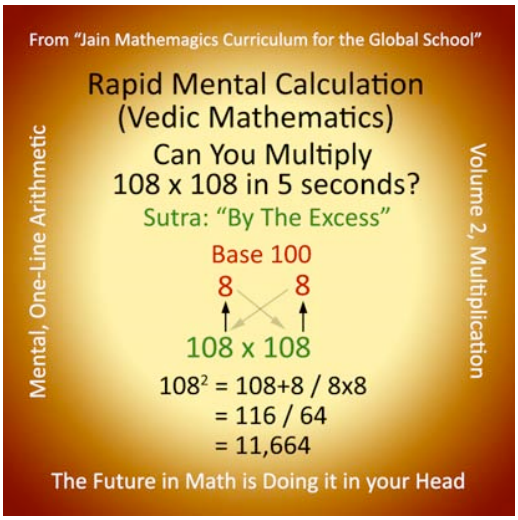
+ see my website to order:
On my Home Page click on "Magnetic Toys" then "Magic Diamond".

❖ MAGIC DIAMOND ❖ COSTS

Quantity		Cost	Unit Price	Savings
1	→	$15	$15 each	-
3	→	$39	$13 each	$6
5	→	$60	$12 each	$15
20	Wholesale →	$200	$10 each	$100

BACK COVER BLURB

CAN YOU MULTIPLY 108 x 108 IN 5 SECONDS?



• This **9 Lesson** / **9 Week Course** will set you on your path to claim your natural mathematical **Genius**, to build both your **Memory Power** and **Confidence**. Become a Human Bio-Calculator!

• This workbook is excellent for all public and private schools offered as supplementary or complementary curriculum lessons.

• It is designed to have the parent sitting in the class with their child. Ultimately, the aim of this book is to get the student to apply knowledge confidently in practical situations, like being in a supermarket, and mentally calculating the change from $10 when buying 9 apples at 69 cents each, before the girl at the check-out calculates it electronically.

• Jain 108 has been actively teaching **Vedic Mathematics**, and **Sacred Geometry** for the last 30 years, overseas and around Australia.

• He produced the **first dvd in the world** on **Vedic Mathematics For the New Millennium** in 2002, to cater for the growing online curriculum to fulfill his task of making this rare and ancient content available for the **international home-schooling movement**.

• Jain's focus for this university-style learning is towards **Juniors** (9-12 yo) and **Keen Teens**. This **Mathemagics** material is a veritable **Miniversity**, known as the **EarthHeart School** in Byron Bay and known as **The Joy Of Numbers Institute** in Asia. This same workbook is used to teach curious adults.

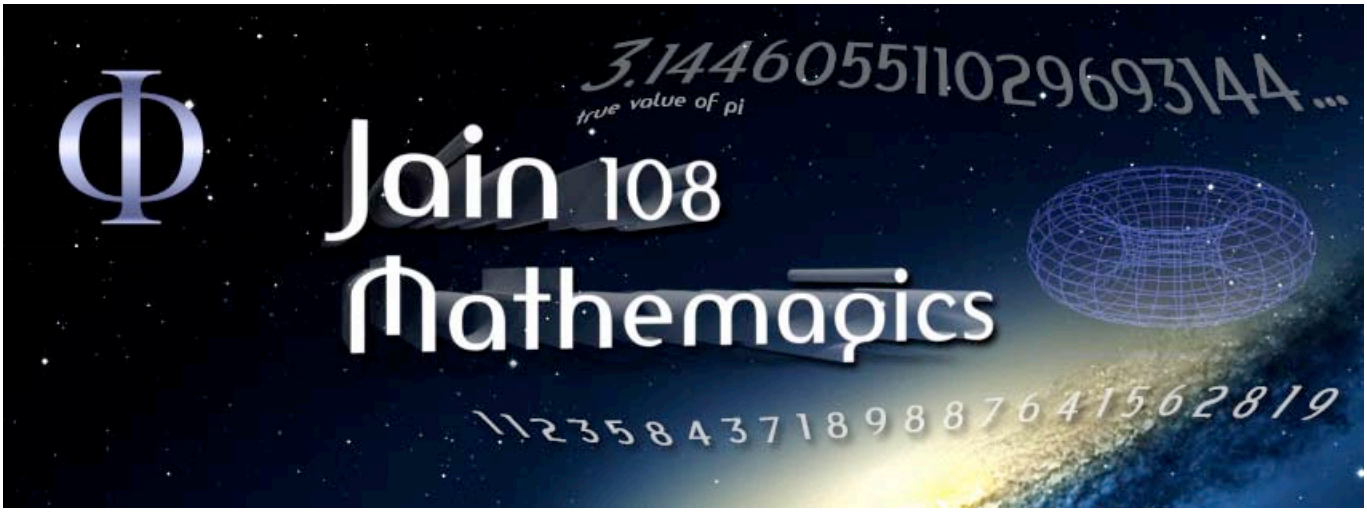
• As an adjunct to this book, there are **dvds** based on live filming of these classes in Mullumbimby (Byron Bay area, far north NSW). The dvds show the true progression of a typical child not knowing these essential sutras or formula, then demonstrating to themselves that they were genuinely able to perform Rapid Mental Calculation, at the Speed of Thought.

• Tribute is given to **Bharati Krsna Tirthaji** who released these 16 sutras about 50 years ago.

• Some of the **Chapter Contents include**:

- **Magic Fingers** to multiply single digits eg: 7x8, and 9x38 and the Moroccan Method to multiply 13x14
- Multiplication by 11 using the sutra: **Digital Compression**
- Sutra: **All From 9 & The Last From 10** to subtract 3,144 from 10,000
- Sutra: **By The Excess** to solve teens being multiplied like 12x18 or 108x108 or 1,011x1,034
- Sutra: **By The Deficiency** to solve 98x87
- **Trachtenberg Method** to single digits by two digits eg 4x24 or 6x6x6
- Sutra: **By One More** for the Squaring Of Numbers Ending In 5 eg: 35x35 or 45^2
- Sutra: **Vertically and Crosswise** to multiply 2 digits by 2 digits like 23x78 and much more

Jain 108 **Director of EarthHeart School**.


3.14460551102969314 4...
true value of pi
Jain 108
Mathemagics
1123584371898876415628 19


THE END

♥ ♡

VEDIC MATHEMATICS

WORKBOOK

• This 9 Lesson / 9 Week Course will set you on your path to claim your natural mathematical Genius, to build both your Memory Power and Confidence. Become a Human Bio-Calculator!
• This workbook is excellent for all public and private schools offered as supplementary or complementary curriculum lessons.
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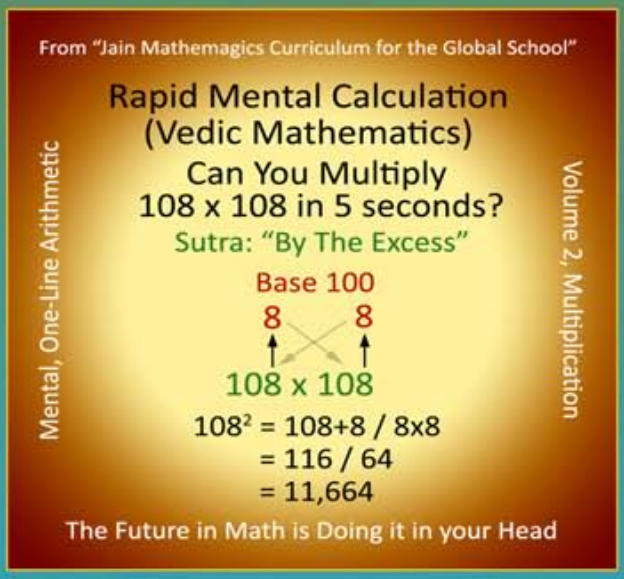
- Sutra: Vertically and Crosswise to multiply 2 digits by 2 digits like 23x78 and much more

CAN YOU MULTIPLY 108 x 108 IN 5 SECONDS?



The Joy of Numbers Institute

jainmathemagics.com

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