VEDIC MATHEMATICS COURSE
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SECTION B
MULTIPLICATION WITH RECOGNIZABLE PATTERNS

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In Section A, we discussed addition and subtraction. In Section B, we shall see some high-speed techniques to multiply numbers when they appear in a certain pattern. The techniques prescribed here are very unconventional and it is difficult to find the logic behind them. But these methods give the results faster than the conventional method of multiplication if you get the numbers in those particular patterns.

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Mathematics that we learn in schools is based on logic. Anything that is not logical or which cannot be proved, is not usually accepted as a valid mathematical theory by mathematicians. For the same reason, many mathematicians have not accepted Vedic mathematics as a branch of mathematics, because according to them it is not backed by proofs. As already said in the Introductory lesson, Swami Bharati Krishna Tirtha had written 16 comprehensive volumes, which unfortunately got lost. Later, in the volume that he re-wrote, he has mentioned that it is intended only to create an interest in the readers and show what is in store for them in Vedic Mathematics in the volumes to come later. He has also mentioned that many more topics and detailed explanations would be dealt in the upcoming volumes. Sadly, he left his mortal frame before passing them on to us.

Vedic Mathematics is based on pattern-observation. Each sūtra signifies a pattern. As we go on learning the sūtras and their applications, we will see how these sūtras can be used in a large number of calculations.

Pattern-observation is very fascinating. As we learn to visualize different patterns in the world around us, we not only improve in mathematics, but also in our creative skills through creative-thinking. It is observed that young children learn many new things through this method of pattern-observation. When you see any colour or design, you relate it to some other object with a similar colour or pattern. As we get used to it, our brain automatically picks up a pattern while doing calculations too, making it a fast and easy task.

Let us look at some patterns that we come across in multiplication.

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LESSON 3
MULTIPLICATION OF COMPLEMENTARY NUMBERS

Observe the following pairs of numbers to be multiplied. Do you see any particular relation in all the numbers? Think!

35	42	77	81
x 35	x 48	x 73	x 89

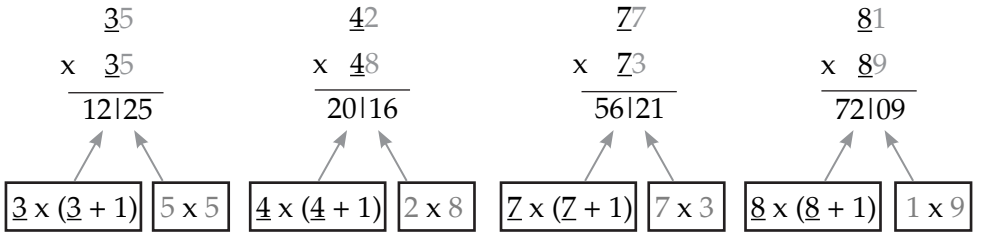
Before you start reading ahead, take your time to observe the above calculations until you see patterns.

You must have observed that

1. The tens place digit is the same in both the numbers **and**
2. The units place digits add upto 10.

For such cases, **(i.e. only if both the conditions are true)** we use the below sūtras:

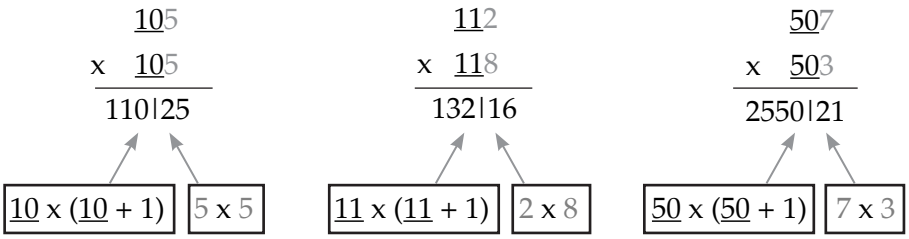
Sūtra	***Upasūtra***
एकाधिकेन पूर्वेण	अन्त्ययोर्दशकेऽपि
Ekādhikena pūrveṇa	*Antyayordaśake'pi*
By one more than the previous one	Sum of last digits is ten



To get the left side of the answer, multiply the tens place digit with one more than the same digit, i.e. if the digit in the tens place is 3, then to get the left side of the answer multiply 3 and 4.

The right side of the answer is arrived at by multiplying the units place digits. And here, we need to keep two digits. Hence, in the last example of 81 x 89 we write 09 instead of 9.

We can use the same rule for multiplying two three-digit numbers whose units place digits add upto then and the remaining digits are same, as in the case of below examples.



The same rule can be used for finding the square of numbers ending with 5. For example, 35^2, 55^2, 85^2, 105^2, and so on.

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Practice Problems

(1) 14 x 16	(5) 51 x 59	(9) 99 x 9	(13) 22 x 28	(17) 77 x 73
(2) 19 x 11	(6) 72 x 78	(10) 48 x 42	(14) 27 x 23	(18) 64 x 66
(3) 17 x 13	(7) 37 x 33	(11) 74 x 76	(15) 21 x 29	(19) 31 x 39
(4) 63 x 67	(8) 26 x 24	(12) 56 x 54	(16) 18 x 12	(20) 83 x 87

(21) 0.93 x 0.97	(27) 8.6 x 8.4	(33) 55^2	(39) 950^2	(45) 0.25^2
(22) 0.52 x 0.58	(28) 6.9 x 6.1	(34) 85^2	(40) 650^2	(46) 7.5^2
(23) 0.71 x 0.79	(29) 5.7 x 5.3	(35) 95^2	(41) 5.5^2	(47) 2.5^2
(24) 0.62 x 0.68	(30) 45^2	(36) 750^2	(42) 9.5^2	(48) 0.95^2
(25) 0.41 x 0.49	(31) 15^2	(37) 550^2	(43) 11.5^2	(49) 0.65^2
(26) 9.2 x 9.8	(32) 75^2	(38) 150^2	(44) 0.15^2	(50) 1.5^2

Answer Set

(1) 224	(11) 5624	(21) 0.9021	(31) 225	(41) 30.25
(2) 209	(12) 3024	(22) 0.3016	(32) 5625	(42) 90.25
(3) 221	(13) 616	(23) 0.5609	(33) 3025	(43) 132.25
(4) 4221	(14) 621	(24) 0.4216	(34) 7225	(44) 0.0225
(5) 3009	(15) 609	(25) 0.2009	(35) 9025	(45) 0.0625
(6) 5616	(16) 216	(26) 90.16	(36) 562500	(46) 56.25
(7) 1221	(17) 5621	(27) 72.24	(37) 302500	(47) 6.25
(8) 624	(18) 4224	(28) 42.09	(38) 22500	(48) 0.9025
(9) 9009	(19) 1209	(29) 30.21	(39) 902500	(49) 0.4225
(10) 2016	(20) 7221	(30) 2025	(40) 422500	(50) 2.25