

India's Next Gift to the World Could be VEDIC SPEED MATHEMATICS

**Come let us Learn Ancient India's
Amazingly Compact and
Powerful System of Calculation**

94×96
 $94 \mid 6$
 $96 \mid 4$
 $90 \mid 24$
 9024

108×112
 $108 \mid 8$
 $112 \mid 12$
 $120 \mid 96$
 12096

108^2
 $B: 100 S: +8$
 $108 \times 8 \mid 8^2$
 $116 \mid 64$
 11604

$29 + 18 + 1 + 2$

VEDIC SPEED MATHEMATICS

(Journey from Limited Intelligence to Human Bio-Calculator)

**Become
MatheMagician in
21 Days**

**Solve Complex
Problems in Few
Seconds**

**Come out
of Maths
Phobia**

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M.Tech (Computers); Formerly Asst. Professor

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Beauty of Vedic Speed Mathematics

(World's Fastest Mental Calculation System)

(with free workbook inside)

Third Edition

HIGHLY USEFUL FOR: Standard/Grade 3rd to Ph.D Students; Parents, Mathematics Teachers, Math Lovers, Placement & Job Interviews; All Entrance & Competitive Exams (PSAT/NMSQT, UPSC - CSAT, Banking - IBPS, RBI, CAT, MAT, Railways - RRB, PSUs, GATE, IES, SSC, LIC, TET, GRE, GMAT, SAT, ACT, PERT, GED, TASC etc.).



Chaitanya A. Patil (Speed16 Academy)

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IMP Note:

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1. Switch to Unit (or Point) of your Interest.
2. Read Working Procedure.
3. Go through Solved Examples.
4. Read Explanation of Examples (if required)
5. Bonus: Observe Pictorial Guidelines (Graphical Representations) for easy Remembrance.
6. Solve Exercises (given in this book & in workbook).
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8. After Practice, you will be able to solve any problems mentally.
9. Optionally you can refer eBook & Video Course on “Vedic Speed Mathematics”. Link is: www.Speed16.com/books/vm

NOTE: In this book, in most of the solved examples, we solved problems in many steps. This is for your better understanding. Once you understand, skip the steps and directly go for answers.

NOTE: Follow this link (www.Speed16.com/books/vm) for Supplement (Graphical Representation of various methods), Sample Pages of Book, FREE Workbook (For solving Exercises) and Video Course.

Features of this Book:

- ✚ Simple and Easy English.
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- ✚ Many Solved Examples with Relevant Explanation.
- ✚ Step by Step Solution for Better Understanding.
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- ✚ Just Remember 1 Liner Formula (Pattern) & Solve Complex Problems in just Few Seconds.
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MULTIPLICATION

Multiplication means times or repeated addition.

Ex.1: $13 \times 3 = 39$ (or $13 + 13 + 13 = 39$)

Ex.2: $24 \times 4 = 96$ (or $24 + 24 + 24 + 24 = 96$)

1.1 Multiplication using Base Method

- Bases** are any positive numbers ending with 0's (zeroes).
Ex: 70, 80, 90, 100, 140, 1300, 5600 etc.
- Working** (or functional) **Base** is always power of 10.
Ex: 10 (10^1), 100 (10^2), 1000 (10^3), 10000 (10^4) etc.
- Surplus** = Number – Base
- Complement** = Number – Base
- Note:** In multiplication, Base method is preferred if given numbers are nearer (closer) to Working Bases. Otherwise Criss Cross method is preferred.
- Formula used: 'Nikhilam Navataścaramam Daśatah' (निखिलं नवतश्चरमं दशतः) **Meaning:** All from 9 and the last from 10.

Number	Base	Surplus
12	10	+2
107	100	+7
1145	1000	+145
12364	10000	+2364
57	50	+7
1846	1800	+46

Number	Base	Complement
8	10	-2
93	100	-7
974	1000	-26
845	1000	-155
57	60	-3
1846	1900	-54

In Vedic Speed Mathematics we get answers quickly if we choose Working Bases. So Prefer Working Bases over Bases. Ex. For 93 Base is both 90 and 100. Choose 100 over 90 because 100 is Working Base.

Abbreviations used	D: Digit	B: Base	C: Complement
	S: Surplus	BM: Base Multiple	BR: Base Ratio

Case 1: When both numbers (Multiplicand and Multiplier) are Greater than the Working Base:

Working Procedure:

1. Write multiplicand and multiplier one below the other.
2. Write surpluses of multiplicand and multiplier to its right side with signs.
3. Answer consists of two parts. Left Part and Right Part.
4. Left Part: Evaluation of any of the cross values (Addition).
5. Right Part: Product of both the surpluses (right side values).
6. **Caution:** Total number of digits in the Right Part should be same as total number of zeroes in the base. If lesser, add required number of zeroes before the right part. If greater, carry the left most excess digits of Right Part to Left Part.

Ex.1:12×14	Ex.1: 12×14; here we need to multiply 12 and 14. Multiplicand (12) and Multiplier ((14) are written one below the other. Surplus of 12 is +2 (12-10) & Surplus of 14 is +4 (14-10). Left Part is 16 (12+4 or 14+2). Right Part is product of both the surpluses i.e. 2×4=8. So final answer is 168.
Base = 10	
12 +2	
14 +4	

16 8	
168	

Ex.2:108×112	Ex.2: 108×112; here we need to multiply 108 and 112. Multiplicand (108) and Multiplier (112) are written one below the other. Surplus of 108 is +8 (108-100) & Surplus of 112 is +12 (112-100). Left Part is 120 (108+12 or 112+8). Right Part is product of both the surpluses i.e. 8×12=96. So final answer is 12096.
Base = 100	
108 +8	
112 +12	

120 96	
12096	

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Ex.3:117×110	Ex. 3: 117×110 ; surpluses are +17 and +10 respectively. Left Part is 127 ($117+10$ or $110+17$). Right Part is 170 (17×10). Caution: Here base is 100 (Two Zeroes). But in the Right Part we are having three digits. Leftmost digit of right part (here it is 1) is transferred to left part. So Left part becomes 128 ($127+1$) and Right part becomes 70. So final answer is 12870.
Base = 100	
117 +17	
110 +10	

127 170	
127+1 70	
128 70	
12870	

Ex. 4: 1020×1033	Ex. 4: 1020×1033 ; surplus: +20 and +33. Left Part is 1053 ($1020+33$ or $1033+20$). Right Part is 660 (20×33). Here base is 1000 (Three Zeroes). Right part is having three digits. So no any further actions are required. The final answer is 1053660.
Base = 1000	
1020 +20	
1033 +33	

1053 660	
1053660	

Ex.5:104×102	Ex. 5: 104×102 ; surplus: +4 and +2. Left Part is 106 ($104+2$ or $102+4$). Right Part is 8 (4×2). Here base is 100 and there are two zeroes in the base. But in the Right part we are having only one digit. So, we need to add one zero before 8 to make it as two digit number. So our final answer is 10608.
Base = 100	
104 +4	
102 +2	

106 8	
106 08	
10608	

Ex.6: 112×125?	Ex.7: 126×104?	Ex.8: 1048×1040?
Base = 100	Base = 100	Base = 1000
112 +12	126 +26	1048 +48
125 +25	104 +4	1040 +40
-----	-----	-----
137 300	130 104	1088 1920
137+3 00	130+1 04	1088+1 920
140 00	131 04	1089 920
14000	13104	1089920

Ex.9: 12745×10200?	Ex.10: 1024×1006?	Ex.11: 113×107
Base = 10000	Base = 1000	Base = 100
12745 +2745 10200 +200 ----- 12945 549000 12945+54 9000 12999 9000	1024 +24 1006 +6 ----- 1030 144	113 +13 107 +7 ----- 120 91
129999000	1030144	12091

Ex.12: 109×121?	Ex.13: 107×114?	Ex.14: 102×103?
Base =	Base =	Base =

Ex.15: 115×108?	Ex.16: 129×106?	Ex.17: 1016×1008?
Base =	Base =	Base =

Ex.18:1251×1003?	Ex.19:1673×1001?	Ex.20:1042×1020?
Base =	Base =	Base =

Ex.21:1037×1039?	Ex.22: 1461×1002?	Ex.23: 1278×1010?
Base =	Base =	Base =

Ex.24:10450×10020	Ex.25:12451×10002	Ex.26:10600×13211
Base =	Base =	Base =

Case 2: When both numbers (Multiplicand and Multiplier) are Less than the Working Base:

Working Procedure:

1. Write multiplicand and multiplier one below the other.
2. Write complements of multiplicand and multiplier to its right side with signs.
3. Answer consists of two parts. Left Part and Right Part.
4. Left Part: Evaluation of any of the cross values (Subtraction)
5. Right Part: Product of both complements (right side values).
6. **Caution:** Total number of digits in the Right Part should be same as total number of zeroes in the base. If lesser, add required number of zeroes before the right part. If greater, carry the left most excess digits of Right Part to Left Part.

Ex.1: 94×96	Ex.1: Here we need to multiply 94 and 96. Base is 100 as both the given numbers (94 and 96) are closer to 100. Complement of 94 is -6 (94-100) and complement of 96 is -4 (96-100). Left Part is 90 (94-4 or 96-6). Right Part is 24 (-6*-4). So final answer is: 9024.
Base = 100	
94 -6	
96 -4	
----- 90 24	
9024	

Ex.2: 90×89	Ex.2: 90×89; Here complements are -10 and -11. Left Part is 79 (90-11 or 89-10). Right Part is 110 (-10 * -11). In the base there are two zeroes, so right part should be of two digits. But, in the Right Part we are having three digits. So we need to transfer leftmost excess digit of Right Part (1) to Left Part. Left Part becomes 79+1=80 and Right Part becomes 10. Final answer is: 8010.
Base = 100	
90 -10	
89 -11	
----- 79 110 79+1 10 80 10	
8010	

Ex.3: 997×993	Ex.3: 997×993; Base is 1000. Complements are -3 and -7. Left Part is 990 (997-7 or 993-3). Right Part is 021 (-3*-7). IMP Note: -3*-7=21. But we need to add one ZERO before 21 to make it as three digit number. Because base is 1000 & having THREE zeroes. So, in the Right Part we should have three digits.
Base = 1000	
997 -3	
993 -7	

990 21	
990 021	
990021	

Ex.4: 950×930	Ex.4: 950×930: complements are -50 and -70. Left Part is 880 (950-70 or 930-50). Right Part is 3500 (-50*-70). Here base is 1000 (Three Zeroes) and Right Part is having four digits. So Left most excess digit of Right Part (3) is passed as carry to Left Part. So Left Part becomes 880+3=883 and Right Part becomes 500. So final answer is: 883500.
B = 1000	
950 -50	
930 -70	

880 3500	
880+3 500	
883 500	
883500	

Ex.5: 81×92?	Ex.6: 76×95?	Ex.7: 985×960?
Base = 100	Base = 100	Base = 1000
81 -19	76 -24	985 -15
92 -8	95 -5	960 -40
-----	-----	-----
73 152	71 120	945 600
73+1 52	71+1 20	
74 52	72 20	
7452	7220	945600

"Success is not final; failure is not fatal: It is the courage to continue that counts."

"It is better to fail in originality than to succeed in imitation."

"The road to success and the road to failure are almost exactly the same."

"Success usually comes to those who are too busy to be looking for it."

Ex.8: 9800×9784?	Ex. 9: 84×94?	Ex.10: 996×975?
Base = 10000	Base = 100	Base = 1000
9800 -200 9784 -216 ----- 9584 43200 9584+4 3200 9588 3200	84 -16 94 -6 ----- 78 96	996 -4 975 -25 ----- 971 100
95883200	7896	971100

Ex.11: 88×91	Ex.12: 87×96	Ex.13: 79×92
Base =	Base =	Base =

Ex.14: 86×89	Ex.15: 984×975	Ex.16: 875×997
Base =	Base =	Base =

Ex.17: 780×996	Ex.18: 979×989	Ex.19: 9880×9996
Base =	Base =	Base =

Ex.20: 875×997	Ex.21: 749×998	Ex.22: 896×927
Base =	Base =	Base =

Ex.23: 938×899	Ex.24: 979×984	Ex.25: 623×999
Base =	Base =	Base =

Case 3: When one number is Lesser and other is Greater than the Working Base:

Working Procedure:

1. Write multiplicand and multiplier one below the other.
2. Write complement / surplus of multiplicand and multiplier to its right side with signs.
3. Left Part: Evaluation of any of the cross values as per the sign (addition or subtraction).
4. Right Part: Product of both complement and surplus.
5. **Additional Step:** In this case, in the Right Part we always get negative value. Let 'n' be the total number of zeroes in the base. To get 'n' digit positive number in the Right Part, Add 'x' times of Base to the Right Part and Parallely Subtract 'x' from Left Part. Read explanation of below examples to get more clarity.

Ex.1: 8×13	Ex.1: 8×13; Complement of 8 is -2 and Surplus of 13 is +3. Left Part is 11 (8+3 or 13-2). Right Part is product of complement and surplus. i.e. -2×3=-6. Here base is 10 & there is only one zero in the base. So, in the Right Part we should have one digit positive number but having negative value. To get one digit positive number, we need to add ONE time of base to Right Part. Parallely we need to subtract 1 from Left Part. Right Part is 4 (∴-6+10=4) and Left Part is 10 (∴11-1=10). So final answer is 104.
Base = 10	
08 -2	
13 +3	

11 -6	
11-1 -6+10	
10 4	
104	

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Ex.2: 106×76	Surplus of 106 is +6 and Complement of 76 is -24. Left Part is 82 (106-26 or 76+6). Right Part is product of surplus and complement. i.e. $6 \times -24 = -144$. Here base is 100 & there are two zeroes in the base. So, in the Right Part we should have two digit positive number but having negative value. To get two digit positive number, we need to add TWO times of base to Right Part. Parallely we need to subtract 2 from
Base = 100	
106 +6	
76 -24	

82 -144	Right Part. Parallely we need to subtract 2 from
82-2 -144+200	
80 56	
= 8056	

Left Part. Right Part is 56 ($\therefore -144+200=56$) and Left Part is 80 ($\therefore 82-2=80$). Final answer is 104. **Note:** If we add one time of base to Right Part; we get -44 ($\therefore -144+100=-44$). We don't want negative value in the Right Part. If we add three times of base; we get 156 ($\therefore -144+300=156$). We don't want three digit number in the Right Part as our base is 100 and having two zeroes. That's why we choose two times of base. After choosing we get required two digit positive number in the Right Part.

Ex.3: 109×94	Surplus of 109 is +9 and Complement of 94 is -6. Left Part is 103 (109-6 or 94+9). Right Part is product of surplus and complement. i.e. $9 \times -6 = -54$. Here base is 100 & there are two zeroes in the base. So, in the Right Part we should have two digit positive number but having negative value. To get two digit positive number, we need to add ONE time of base to Right Part. Parallely we need to subtract 1 from Left Part. Right Part is 46 ($\therefore -54+100=46$) and Left Part is 102 ($\therefore 103-1=102$). Final answer is 10246.
Base = 100	
109 +9	
94 -6	

103 -54	Right Part is 46 ($\therefore -54+100=46$) and Left Part is 102 ($\therefore 103-1=102$). Final answer is 10246.
103-1 -54+100	
102 46	
= 10246	

If opportunity doesn't knock, build a door --Milton Berle

The way to get started is to quit talking and begin doing --Walt Disney

Ex.4: 97×124	Complement of 97 is -3 and Surplus of 124 is +24. Left Part is 121 (97+24 or 124-3). Right Part is product of complement and surplus. i.e. -3×24=-72. Here base is 100 & there are two zeroes in the base. So, in the Right Part we should have two digit positive number but having negative value. To get two digit positive number, we need to add ONE time of base to
Base = 100	
97 -3	
124 +24	
121 -72	
121-1 -72+100	Right Part. Parallely we need to subtract 1 from Left Part. Right Part is 28 (:: -72+100=28) and Left Part is 120 (:: 121-1=120). Final answer is 12028.
120 28	
=12028	

Note: There is an alternative for additional step. Multiply Left Part with base. Add Right Part to it. We will get answer. For example:

Ex.2: Left Part is 82. Base is 100. Multiply both. Product is 8200. Add Right Part (-144) to it. So final answer is 8200 + (-144) = 8200 - 144 = 8056.

Ex.4: Left Part is 121. Base is 100. Multiply both. Product is 12100. Add Right Part (-72) to it. So final answer is 12100+(-72) = 12100 - 72 = 12028.

Ex.5: 1020×989	Surplus of 1020 is +20 and Complement of 989 is -11. Left Part is 1009 (1020-11 or 989+20). Right Part is product of surplus and complement. i.e. 20×-11=-220. Here base is 1000 & there are three zeroes in the base. So, in the Right Part we should have three digit positive number but having negative value. To get three digit positive number, we need to add ONE time of base to Right Part.
B = 1000	
1020 +20	
989 -11	
----- 1009 -220	
1009-1 -220+1000	Parallely we need to subtract 1 from Left Part. Right Part is 780 (:: -220+1000=780) and Left Part is 1008 (:: 1009-1=1008). Final answer is 1008780.
1008 780	
=1008780	

Ex.6: 1250×975	Surplus of 1250 is +250 and Complement of 975 is -25. Left Part is 1225 (1250-25 or 975+250). Right Part is product of surplus and complement. i.e. 250×-25=-6250. Here base is 1000 & there are three zeroes in the base. So, in the Right Part we should have three digit positive number but having negative value. To get three digit positive number, we need to add
Base = 1000	
$\begin{array}{r} 1250 \quad +250 \\ 975 \quad -25 \\ \hline 1225 \quad -6250 \\ 1225-7 \quad -6250+7000 \\ 1218 \quad 750 \\ \hline =1218750 \end{array}$	

SEVEN times of base to Right Part. Parallely we need to subtract 7 from Left Part. Right Part is 750 ($\because -6250+7000=750$) and Left Part is 1218 ($\because 1225-7=1218$). Final answer is 1218750

Ex.7:	Ex.8:	Ex.9:	Ex.10:
89×112?	92×116?	976×1030?	870×1026?
Base = 100	Base = 100	Base = 1000	Base=1000
$\begin{array}{r} 89 \quad -11 \\ 112 \quad +12 \\ \hline 101 \quad -132 \\ 101-2 \quad -132+200 \\ 99 \quad 68 \end{array}$	$\begin{array}{r} 92 \quad -8 \\ 116 \quad +16 \\ \hline 108 \quad -128 \\ 108-2 \quad -128+200 \\ 106 \quad 72 \end{array}$	$\begin{array}{r} 976 \quad -24 \\ 1030 \quad +30 \\ \hline 1006 \quad -720 \\ 1006-1 \quad -720+1000 \\ 1005 \quad 280 \end{array}$	$\begin{array}{r} 870 \quad -130 \\ 1026 \quad +26 \\ \hline 896 \quad -3380 \\ 896-4 \quad -3380+4000 \\ 892 \quad 620 \end{array}$
9968	10672	1005280	892620

Ex.11: 92×107?	Ex.12: 99×436? <small>B:100</small>	Ex.13: 98×284?

Ex.14: $103 \times 77?$	Ex.15: $106 \times 69?$	Ex.16: $121 \times 93?$

Ex.17: $1040 \times 996?$	Ex.18: $1874 \times 999?$	Ex.19: $1232 \times 998?$

Ex.20: $10201 \times 9987?$	Ex.21: $10040 \times 9860?$	Ex.22: $12465 \times 9700?$

Case 4: Working with two different Bases:

Working Procedure:

1. Write multiplicand and multiplier one below the other.
2. Total number of digits in multiplicand and multiplier should be same. If not add required number of zeroes (say 'n') to smaller number at the end.
3. Calculate product using any of the applicable cases (1, 2 or 3).
4. Cut all 'n' ending zeroes from intermediate answer to get final answer.

<p>Ex.1: 989×92</p> <pre> 989 92 ----- 989 -11 920 -80 ----- 909 880 909880 =90988 </pre>	<p>Ex. 1: 989×92; Here 92 is smaller. Place one zero at the end of 92. It becomes 920. Now calculate product of 989 and 920 using case 2. It gives 909880. We added one zero, so cut one ending zero to get final answer (90988)</p>
---	---

Ex.2:991×9970	Ex.3:96×9840	Ex.4:56×580	Ex.5:11×1040
<pre> 991 9970 ----- 9910 -90 9970 -30 ----- 9880 2700 98802700 98802700 </pre>	<pre> 96 9840 ----- 9600 -400 9840 -160 ----- 9440 64000 9440+6 4000 9446 4000 94464000 94464000 </pre>	<pre> 56 580 ----- 560 -40 580 -20 ----- 540 800 540×6 800 3240 800 3240+8 800-800 3248 00 </pre>	<pre> 11 1040 ----- 1100 +100 1040 +40 ----- 1140 4000 1140+4 000 1144000 1144000 </pre>
9880270	944640	32480	11440

Ex.6:	Ex.7:	Ex.8:	Ex.9:
89×974?	98×1042?	94×10124?	76×9850?
89 974	98 1042	94 10124	76 9850
890 -110 974 -26	980 -20 1042 +42	9400 -600 10124 +124	7600 -2400 9850 -150
----- 864 2860 864+2 860 866 860	----- 1022 -840 1022-1 -840+1000 1021 160	----- 9524 -74400 9524-8 -74400+80000 9516 5600	----- 7450 360000 7450+36 0000 7486 0000
86686	102116	951656	748600

Ex.10: 94×988	Ex.11: 89×996	Ex.12: 986×9974

Ex.13: 106×987	Ex.14: 112×974	Ex.15: 1024×96

Ex.16: 876×91	Ex.17: 103×9874	Ex.18: 109×1231

Ex.19: 107×12234	Ex.20: 88×9760	Ex.21: 92×1016

Ex.22: 1016×12241	Ex.23: 1212×77	Ex.24: 984×9976

Case 5: When both numbers are not nearer to Working Bases:

Some Examples:

Ex.: 592×624 ?

Ex.: 410×874 ?

Ex.: 1824×1208 ?

Ex.: 65475×3456 ?

Case 5 is little tricky as compared to other cases (1 to 4). There is an alternative for Case 5 (as well as to all other Cases). Alternative method is **Criss Cross Method** (We are learning this in the next Section). So avoid Case 5. Prefer Criss Cross method over Case 5 of Base Method. Download Appendix if you want more information (Working Procedure and Solved Examples of case 5) by following below link.

Link: www.Speed16.com/books/vm

1.2 Multiplication using Criss Cross Method

Formula Used: 3. Ūrdhva – tiryagbhyām (ऊर्ध्वतिर्यग्भ्याम्)

Meaning: Vertically & Crosswise

How to Remember? Here you no need to remember any formulas, just you need to understand pattern. Go through graphical representation of various cases and understand pattern.

Case 1: Two Digit Numbers ($2D \times 2D$ and $2D \times 1D$) {D: Digit}

Answer consists of three parts.

First Part:	Second Part:	Third Part:
$\begin{array}{cc} a & b \\ & \\ c & d \end{array}$	$\begin{array}{cc} a & b \\ \diagdown & \diagup \\ c & d \end{array}$	$\begin{array}{cc} a & b \\ & \\ c & d \end{array}$
(a×c)	(a×d) + (b×c)	(b×d)

- First Part is product of respective first digits of both multiplier and multiplicand.
- Second Part is applying criss cross on all digits of both multiplier and multiplicand.
- Last Part is product of respective last digits of both multiplier and multiplicand.

Ex. 1: 42 × 57	Ex. 2: 84 × 36
$\begin{array}{r} 4 \ 2 \\ \times 5 \ 7 \\ \hline \end{array}$	$\begin{array}{r} 8 \ 4 \\ \times 3 \ 6 \\ \hline \end{array}$
$(4 \times 5) \mid (4 \times 7 + 2 \times 5) \mid (2 \times 7)$	$(8 \times 3) \mid (8 \times 6 + 4 \times 3) \mid (4 \times 6)$
$20 \mid 28+10 \mid 14$	$24 \mid 48+12 \mid 24$
$20 \mid 38 \mid 14$	$24 \mid 60 \mid 24$
$20 \mid 38+1 \mid 4$	$24 \mid 60+2 \mid 4$
$20 \mid 39 \mid 4$	$24 \mid 62 \mid 4$
$20+3 \mid 9 \mid 4$	$24+6 \mid 2 \mid 4$
$23 \mid 9 \mid 4$	$30 \mid 2 \mid 4$
2394	3024

Ex.1: Calculate & Place Values as per Pattern. Evaluate all parts. All Parts except first should contain only one digit. Start observation from Right and go towards Left. If you find more than one digit in any of the parts, then pass leftmost excess digits to its immediate left part.

Ex. 3: 67 × 89	Ex. 4: 76 × 59
$\begin{array}{r} 6 \ 7 \\ \times 8 \ 9 \\ \hline \end{array}$	$\begin{array}{r} 7 \ 6 \\ \times 5 \ 9 \\ \hline \end{array}$
$(6 \times 8) \mid (6 \times 9 + 7 \times 8) \mid (7 \times 9)$	$(7 \times 5) \mid (7 \times 9 + 6 \times 5) \mid (6 \times 9)$
$48 \mid 54+56 \mid 63$	$35 \mid 63+30 \mid 54$
$48 \mid 110 \mid 63$	$35 \mid 93 \mid 54$
$48 \mid 110+6 \mid 3$	$35 \mid 93+5 \mid 4$
$48 \mid 116 \mid 3$	$35 \mid 98 \mid 4$
$48+11 \mid 6 \mid 3$	$35+9 \mid 8 \mid 4$
$59 \mid 6 \mid 3$	$44 \mid 8 \mid 4$
5963	4484

Ex. 5: 78×8	Ex. 6: 83×7
$\begin{array}{r} 78 \\ \times 08 \\ \hline \end{array}$	$\begin{array}{r} 83 \\ \times 07 \\ \hline \end{array}$
$(7 \times 0) \downarrow (7 \times 8 + 8 \times 0) \downarrow (8 \times 8)$ $0 \downarrow 56 + 0 \downarrow 64$ $0 \downarrow 56 \downarrow 64$ $0 \downarrow 56 + 6 \downarrow 4$ $0 \downarrow 62 \downarrow 4$ $0 + 6 \downarrow 2 \downarrow 4$ $6 \downarrow 2 \downarrow 4$	$(8 \times 0) \downarrow (8 \times 7 + 2 \times 0) \downarrow (3 \times 7)$ $0 \downarrow 56 + 0 \downarrow 21$ $0 \downarrow 56 \downarrow 21$ $0 \downarrow 56 + 2 \downarrow 1$ $0 \downarrow 58 \downarrow 1$ $0 + 5 \downarrow 8 \downarrow 1$ $5 \downarrow 8 \downarrow 1$
624	581

Ex.7: 59×62	Ex.8: 41×96	Ex.9: 87×58
$\begin{array}{r} 59 \\ \times 62 \\ \hline \end{array}$	$\begin{array}{r} 41 \\ \times 96 \\ \hline \end{array}$	$\begin{array}{r} 87 \\ \times 58 \\ \hline \end{array}$
$= 30 \downarrow 10 + 54 \downarrow 18$ $= 30 \downarrow 64 \downarrow 18$ $= 30 \downarrow 64 + 1 \downarrow 8$ $= 30 \downarrow 65 \downarrow 8$ $= 30 + 6 \downarrow 5 \downarrow 8$	$= 36 \downarrow 24 + 9 \downarrow 6$ $= 36 \downarrow 33 \downarrow 6$ $= 36 + 3 \downarrow 3 \downarrow 6$ $= 39 \downarrow 3 \downarrow 6$	$= 40 \downarrow 64 + 35 \downarrow 56$ $= 40 \downarrow 99 \downarrow 56$ $= 40 \downarrow 99 + 5 \downarrow 6$ $= 40 \downarrow 104 \downarrow 6$ $= 40 + 10 \downarrow 4 \downarrow 6$
= 3658	= 3936	= 5046

Ex.10: 71×39	Ex.11: 24×87	Ex.12: 37×68
$\begin{array}{r} 71 \\ \times 39 \\ \hline \end{array}$	$\begin{array}{r} 24 \\ \times 87 \\ \hline \end{array}$	$\begin{array}{r} 37 \\ \times 68 \\ \hline \end{array}$
$= 21 \downarrow 63 + 3 \downarrow 9$ $= 21 \downarrow 66 \downarrow 9$ $= 21 + 6 \downarrow 6 \downarrow 9$ $= 27 \downarrow 6 \downarrow 9$	$= 16 \downarrow 14 + 32 \downarrow 28$ $= 16 \downarrow 46 \downarrow 28$ $= 16 \downarrow 46 + 2 \downarrow 8$ $= 16 \downarrow 48 \downarrow 8$ $= 16 + 4 \downarrow 8 \downarrow 8$ $= 20 \downarrow 8 \downarrow 8$	$= 18 \downarrow 24 + 42 \downarrow 56$ $= 18 \downarrow 66 \downarrow 56$ $= 18 \downarrow 66 + 5 \downarrow 6$ $= 18 \downarrow 71 \downarrow 6$ $= 18 + 7 \downarrow 1 \downarrow 6$ $= 25 \downarrow 1 \downarrow 6$
= 2769	= 2088	= 2516

Ex.13: 44×69	Ex.14: 68×9	Ex.15: 49×54

Ex.16: 99×24	Ex.17: 87×29	Ex.18: 63×26

Ex.19: 41×62	Ex.20: 69×8	Ex.21: 89×23

Ex.22: 28×93	Ex.23: 36×67	Ex.24: 58×77

Ex.25: 13×62	Ex.26: 29×87	Ex.27: 44×68

Ex.28: 54×67	Ex.29: 63×27	Ex.30: 82×91

Case 2: Three Digit Numbers (3D×3D; 3D×2D and 3D×1D)

Answer consists of Five Parts.

First Part:	Second Part:	Third Part:	Fourth Part:	Fifth Part:
$\begin{array}{ccc} a & b & c \\ d & e & f \end{array}$	$\begin{array}{ccc} a & b & c \\ d & e & f \end{array}$	$\begin{array}{ccc} a & b & c \\ d & e & f \end{array}$	$\begin{array}{ccc} a & b & c \\ d & e & f \end{array}$	$\begin{array}{ccc} a & b & c \\ d & e & f \end{array}$
(a×d)	(a×e)+(b×d)	(a×f)+(b×e)+(c×d)	(b×f)+(c×e)	(c×f)

- First Part is product of respective first digits of both multiplier and multiplicand.
- Second Part is applying Criss Cross on first two digits of both multiplier and multiplicand.
- Third Part is applying Criss Cross on first three (all) digits of both multiplier and multiplicand.
- Fourth Part is applying Criss Cross on last two digits of both multiplier and multiplicand.
- Fifth (Last) Part is product of respective last digits of both multiplier and multiplicand.

Ex. 1: 417 × 765	Ex. 2: 644 × 589
$\begin{array}{ccc} 4 & 1 & 7 \\ \times 7 & 6 & 5 \\ \hline \end{array}$	$\begin{array}{ccc} 6 & 4 & 4 \\ \times 5 & 8 & 9 \\ \hline \end{array}$
$(4 \times 7) \mid (4 \times 6) + (1 \times 7) \mid (4 \times 5) + 1 \times 6$ $+ 7 \times 7 \mid (1 \times 5) + 7 \times 6 \mid (7 \times 5)$	$(6 \times 5) \mid (6 \times 8) + (4 \times 5) \mid (6 \times 9) + 4 \times 8$ $+ 4 \times 5 \mid (4 \times 9) + 4 \times 8 \mid (4 \times 9)$
$28 \mid 24 + 7 \mid 20 + 6 + 49 \mid 5 + 42 \mid 35$	$30 \mid 48 + 20 \mid 54 + 32 + 20 \mid 36 + 32 \mid 36$
$28 \mid 31 \mid 75 \mid 47 \mid 35$	$30 \mid 68 \mid 106 \mid 68 \mid 36$
$28 \mid 31 \mid 75 \mid 47 + 3 \mid 5$	$30 \mid 68 \mid 106 \mid 68 + 3 \mid 6$
$28 \mid 31 \mid 75 \mid 50 \mid 5$	$30 \mid 68 \mid 106 \mid 71 \mid 6$
$28 \mid 31 \mid 75 + 5 \mid 0 \mid 5$	$30 \mid 68 \mid 106 + 7 \mid 1 \mid 6$
$28 \mid 31 \mid 80 \mid 0 \mid 5$	$30 \mid 68 \mid 113 \mid 1 \mid 6$
$28 \mid 31 + 8 \mid 0 \mid 0 \mid 5$	$30 \mid 68 + 11 \mid 3 \mid 1 \mid 6$
$28 \mid 39 \mid 0 \mid 0 \mid 5$	$30 \mid 79 \mid 3 \mid 1 \mid 6$

28+3 9 0 0 5 31 9 0 0 5	30+7 9 3 1 6 37 9 3 1 6
319005	379316

Ex. 3: 844 × 67	Ex. 4: 749 × 9
$\begin{array}{r} 8 \ 4 \ 4 \\ \times 0 \ 6 \ 7 \\ \hline \end{array}$	$\begin{array}{r} 7 \ 4 \ 9 \\ \times 0 \ 0 \ 9 \\ \hline \end{array}$
$(8 \times 0) (8 \times 6) + (4 \times 0) (8 \times 7 + 4 \times 6 + 4 \times 0) (4 \times 7 + 4 \times 6) (4 \times 7)$ 0 48+0 56+24+0 28+24 28 0 48 80 52 28 0 48 80 52+2 8 0 48 80 54 8 0 48 80+5 4 8 0 48 85 4 8 0 48+8 5 4 8 0 56 5 4 8 0+5 6 5 4 8 5 6 5 4 8	$(7 \times 0) (7 \times 0) + (4 \times 0) (7 \times 9 + 4 \times 0 + 9 \times 0) (4 \times 9 + 9 \times 0) (9 \times 9)$ 0 0+0 63+0+0 36+0 81 0 0 63 36 81 0 0 63 36+8 1 0 0 63 44 1 0 0 63+4 4 1 0 0 67 4 1 0 0+6 7 4 1 0 6 7 4 1
56548	6741

Ex.5: 478 × 743	Ex.6: 649×928
$\begin{array}{r} 4 \ 7 \ 8 \\ \times 7 \ 4 \ 3 \\ \hline \end{array}$	$\begin{array}{r} 6 \ 4 \ 9 \\ \times 9 \ 2 \ 8 \\ \hline \end{array}$
$= 28 16+49 12+28+56 21+32 24$ $= 28 65 96 53 24$ $= 28 65 96 53+2 4$ $= 28 65 96 55 4$ $= 28 65 96+5 5 4$ $= 28 65 101 5 4$ $= 28 65+10 1 5 4$ $= 28 75 1 5 4$ $= 28+7 5 1 5 4$ $= 35 5 1 5 4$	$= 54 12+36 48+8+81 32+18 72$ $= 54 48 137 50 72$ $= 54 48 137 50+7 2$ $= 54 48 137 57 2$ $= 54 48 137+5 7 2$ $= 54 48 142 7 2$ $= 54 48+14 2 7 2$ $= 54 62 2 7 2$ $= 54+6 2 2 7 2$ $= 60 2 2 7 2$
= 355154	= 602272

Exercise: Solve using appropriate methods.

1. 14×17	2. 19×16	29. 477×510	30. 369×764
3. 121×119	4. 116×109	31. 415×698	32. 286×478
5. 1024×1005	6. 1039×1010	33. 389×855	34. 475×996
7. 88×91	8. 96×89	35. 785×774	36. 475×875
9. 99×97	10. 980×978	37. 9987×9900	38. 9985×10200
11. 976×988	12. 955×990	39. 7007×7050	40. 9875×9980
13. 971×980	14. 1024×1010	41. 78×99	42. 7×99
15. 1100×1046	16. 1020×1005	43. 874×99	44. 649×999
17. 89×121	18. 91×115	45. 87×999	46. 7436×999
19. 94×117	20. 97×109	47. 96354×999	48. 7465×9999
21. 990×1050	22. 977×1020	49. 316×9999	50. 547×9999
23. 455×485	24. 475×485	51. 54×56	52. 77×73
25. 585×620	26. 690×725	53. 736×764	54. 349×351
27. 78×86	28. 475×520	55. 369×179	56. 411×296

Answers:

1. 238	2. 304	29. 243270	30. 281916
3. 14399	4. 12644	31. 289670	32. 136708
5. 1029120	6. 1049390	33. 332595	34. 473100
7. 8008	8. 8544	35. 607590	36. 415625
9. 9603	10. 958440	37. 98871300	38. 101847000
11. 964288	12. 945450	39. 49399350	40. 98552500
13. 951580	14. 1034240	41. 7722	42. 693
15. 1150600	16. 1025100	43. 86526	44. 648351
17. 10769	18. 10465	45. 86913	46. 7428564
19. 10998	20. 10573	47. 96257646	48. 74642535
21. 1039500	22. 996540	49. 3159684	50. 5469453
23. 220675	24. 230375	51. 3024	52. 5621
25. 362700	26. 500250	53. 562304	54. 122499
27. 6708	28. 247000	55. 66051	56. 121656

6. SQUARES

What is Square: Square is the result of multiplying a number by itself.

For ex. Square of 3 is 9 (3×3); Square of -45 is 2025 (-45×-45)

Square of 12 is 144 (12×12); Square of -12 is 144 (-12×-12)

6.1 Squares of numbers ending with Digit 5

Formula used is: 1. Ekādhikena Pūrvena (एकाधिकेन पूर्वेण)

Meaning: One More than the Previous One

Note: This formula is used to obtain square of numbers ending with digit 5 (Ex. 15, 125, 345, 4585, 6485, 9745 etc.).

Working Procedure:

1. Split the given number into two parts (left and right) using vertical line (|). Right part is last digit (i.e 5) and Left part is remaining digits.
2. Multiply left part with its next number in the number line. Right part is 25 (Square of 5).
3. Remove vertical line, the obtained number is required square of given number.

Ex.1:15 ²	Ex.2:25 ²	Ex.3:75 ²	Ex.4:95 ²	Ex.5:115 ²
1 5	2 5	7 5	9 5	11 5
1×2 25	2×3 25	7×8 25	9×10 25	11×12 25
2 25	6 25	56 25	90 25	132 25
225	625	5625	9025	13225

Ex.6:145 ²	Ex.7:205 ²	Ex.8:795 ²	Ex.9: 1015 ²	10:7995 ²
14 5	20 5	79 5	101 5	799 5
14×15 25	20×21 25	79×80 25	101×102 25	799×800 25
210 25	420 25	6320 25	10302 25	39200 25
21025	42025	632025	1030225	3920025

Ex.3: Left part is 7 and right part is 5. Multiply 7 with its next number in the number line (8). It gives 56. Right part is 25 (5^2). After removing vertical line we get 5625, which is the square of 75

Ex.8: Left part is 79 and right part is 5. Multiply 79 with its next number in the number line (80). It gives 6320. Right part is 25 (square of 5). After removing vertical line we get 632025, which is the square of 795.

Ex.1: 35^2	Ex.2: 195^2	Ex.3: 105^2

Ex.4: 205^2	Ex.5: 45^2	Ex.6: 65^2

Ex.7: 55^2	Ex.8: 115^2	Ex.9: 85^2

6.2 Squares Using Surpluses and Complements

Corollary used is: 7 Yāvādūnam Tāvādūnīkrtya Vargañca Yojayet
 (यावद्दूनं तावद्दूनीकृत्य वर्गं च योजयेत्) **Meaning:** Lessen by the Deficiency and set up the square of that deficiency.

Note: This formula is used to obtain square of numbers which are closer to bases (10, 100, 1000 etc.).

Case 1: When Number is above the Working Base.

Working Procedure:

1. Note given number, its Base (B) and Surplus (S).
2. Answer consists of Two Parts (Left Part and Right Part).
3. Right Part is Square of Surplus.
4. Left Part = (Given Number + Surplus).
5. **Note:** Total number of digits in the Right Part should be same as total number of zeroes in the base. If lesser add required number of zeroes, if greater pass the carry (leftmost excess digits) to left part.

Ex.1: 108^2	Ex.2: 103^2	Ex.3: 1104^2	Ex.4: 1250^2
B:100;S:+08	B:100;S:+3	B:1000;S:+104	B:1000;S:+250
108+8 8^2 116 64	103+3 3^2 106 9 106 09	1104+104 104^2 1208 10816 1208+10 816 1218 816	1250+250 250^2 1500 62500 1500+62 500 1562 500
11664	10609	1218816	1562500

Ex.5: 1205^2	Ex.6: 1301^2	Ex.7: 11320^2
B:1000; S:+205	B:1000; S:+301	B:10000; S:+1320
1205+205 205^2 1410 42025 1410+42 025 1452 025	1301+301 301^2 1602 90601 1602+90 601 1692 601	11320+1320 1320^2 12640 1742400 12640+174 2400 12814 2400
1452025	1692601	128142400

Case 2: When Number is below the Working Base.

Working Procedure:

1. Note given number, its Base and Complement.
2. Answer consists of Two Parts (Left Part and Right Part).
3. Right Part is square of Complement.
4. Left Part = (Given Number + Complement).
5. **Note:** Total number of digits in the Right Part should be same as total number of zeroes in the base. If lesser add required number of zeroes, if greater pass the carry (leftmost excess digits) to left part.

Ex.1: 94^2	Ex.2: 97^2	Ex.3: 87^2
B:100; C: -6	B:100; C: -3	B:100; C: -13
94-6 -6^2 88 36	97-3 -3^2 94 09	87-13 -13^2 74 169 74+1 69
8836	9409	7569

Ex.4: 79^2	Ex.5: 84^2	Ex.6: 976^2
B:100; C: -21	B:100; C: -16	B:1000; C: -24
79-21 -21^2 58 441 58+4 41 62 41	84-16 -16^2 68 256 68+2 56 70 56	976-24 -24^2 952 576
6241	7056	952576

Ex.7: 893^2	Ex.8: 9790^2	Ex.9: 98930^2
B:1000; C:-107	B:10000; C:-210	B:100000; C: -1070
893-107 -107^2 786 11449 786+11 449 797 449	9790-210 -210^2 9580 44100 9580+4 4100 9584 4100	98930-1070 -1070^2 97860 1144900 97860+11 44900 97871 44900
797449	95844100	9787144900

Ex.1: 88^2	Ex.2: 875^2	Ex.3: 117^2
B: C:	B: C:	B: C:

Ex.4: 91^2	Ex.5: 9890^2	Ex.6: 124^2
B: C:	B: C:	B: C:

Ex.7: 76^2	Ex.8: 9989^2	Ex.9: 1102^2
B: C:	B: C:	B: C:

Ex.10: 85^2	Ex.11: 9650^2	Ex.12: 1220^2
B: C:	B: C:	B: C:

Ex.13: 93^2	Ex.14: 102^2	Ex.15: 1045^2
B: C:	B: C:	B: C:

Ex.16: 98^2	Ex.17: 109^2	Ex.18: 116^2
B: C:	B: C:	B: C:

Ex.19: 989^2	Ex.20: 113^2	Ex.21: 190^2
B: C:	B: C:	B: C:

Ex.22: 979^2	Ex.23: 126^2	Ex.24: 10205^2
B: C:	B: C:	B: C:

6.3 Squares using Criss Cross Method

- Square is the result of multiplying a number by itself.
- Square of A is $(A \times A)$; Square of 98456 is (98456×98456) ; Square of 64578965 is $(64578965 \times 64578965)$
- For finding Squares of any complex (bigger) numbers, apply Criss Cross Method. We already Studied Multiplication using Criss Cross Method and refer the same for finding squares of any number.

Ex.1: 83^2	Ex.2: 678^2	Ex.3: -59^2
8 3	6 7 8	5 9
8 3	6 7 8	5 9
-----	-----	-----
64 24+24 9	36; 42+42; 48+49+48; 56+56; 64	25 45+45 81
64 48 9	36 84 145 112 64	25 90 81
64+4 8 9	45 99 156 118 64	34 98 81
68 8 9	459684	3481
6889	459684	3481

Ex.4: 74^2	Ex.5: -396^2	Ex.6: 578^2
7 4	3 9 6	5 7 8
7 4	3 9 6	5 7 8
-----	-----	-----
49 28+28 16	9; 27+27; 18+81+18; 54+54; 36	25 70 129 112 64
49 56 16	9 54 117 108 36	33 84 140 118 64
54 57 16	15 66 128 111 36	
5476	156816	334084

Ex.1: 349^2	Ex.2: 426^2	Ex.3: 512^2

Ex.4: 568^2	Ex.5: 789^2	Ex.6: 880^2

Ex.7: 29^2	Ex.8: 43^2	Ex.9: 3456^2

Ex.10: 67^2	Ex.11: 78^2	Ex.12: 7321^2

Ex.13: 81^2	Ex.14: 109^2	Ex.15: 8426^2

Ex.16: 146^2	Ex.17: 235^2	Ex.18: 9271^2

Exercise: Find squares of following numbers.

1. 25	2. 35	3. 45	4. 55	5. 65	6. 135
7. 185	8. 195	9. 355	10. 495	11. 49	12. 94
13. 104	14. 112	15. 109	16. 113	17. 97	18. 93
19. 473	20. 239	21. 477	22. 369	23. 89	24. 74
25. 76	26. 98	27. 73	28. 36	29. 984	30. 746
31. 638	32. 697	33. 1005	34. 977	35. 983	36. 1036
37. 1058	38. 666	39. 305	40. 989		

Answers:

1. 625	2. 1255		21. 227529	22. 136161
3. 2025	4. 3025		23. 7921	24. 5476
5. 4225	6. 18225		25. 5776	26. 9604
7. 34225	8. 38025		27. 5329	28. 1296
9. 126025	10. 245025		29. 968256	30. 556516
11. 2401	12. 8836		31. 407044	32. 485809
13. 10816	14. 12544		33. 1010025	34. 954529
15. 11881	16. 12769		35. 966289	36. 1073296
17. 9409	18. 8649		37. 1119364	38. 443556
19. 223729	20. 57121		39. 93025	40. 978121

Plastics give a helpful hand, but they are polluting our land!

Choose to be a scholastic; refuse plastic.

Don't laminate the earth!

Many innocent animals eat plastic and die due to which our earth cry.

If you are kind so show your kindness towards reducing plastic.

Save our best friend earth from the plastic.

Go Green ,no plastic ,everything is Fantastic.

12. POLYNOMIALS

Polynomials: Polynomial is addition /subtraction /multiplication /division of constants, variables and exponents, but

1. Division by variable is not allowed (but division by constant is allowed).
2. Variable's exponents can only be whole numbers (0,1,2,3,...).
3. Number of terms should be finite.
 - Constants: 14, 36, -74, -963 etc.
 - Variables: x, y, z, a, b, c, p, q, r, s etc.
 - Exponents: x^2 , x^3 etc.
 - If $p(x)$ is a polynomial in x, the highest power of x is called degree of polynomial.
 - Polynomials with one term is called monomial, with two terms is called binomial; with three terms is called Trinomials.

Ex.1: $x^2+7x+12$ (Degree: 2)

Ex.2: $x^3-13x^2+2x-87$ (Degree: 3);

Ex.3: x^4-8x^2+12x (Degree:4); etc.

Types of Polynomials:

- A polynomial of degree 1 is called linear polynomial.
- A polynomial of degree 2 is called quadratic polynomial.
- A polynomial of degree 3 is called cubic polynomial.
- A polynomial of degree 4 is called biquadratic (or quartic) polynomial.

NOTE: Download below supplement for Graphical Representation of various methods and other materials.

Link: www.chaitanyapatil.in/books/vms1.pdf

12.1 Multiplication using Criss Cross Method

Sutra 3: Ūrdhva – tiryagbhyām; (ऊर्ध्वतिर्यग्भ्याम्)

Meaning: Vertically & Crosswise

Note: Read Multiplication using Criss Cross Method from Multiplication Unit.

Working Procedure:

1. Write coefficients of both polynomials one below the other separated by spaces. Write coefficient as zero if any term is absent.
2. Apply Criss Cross method on coefficients.
3. No need to alter any parts (it means **don't** transfer leftmost excess digits to its immediate left part).
4. Last part is constant. Go on incrementing powers of variable by 1 from right side. Second last is x, then x^2 , x^3 , x^4 , x^5 and so on.

CASE 1: (2×2; 2×1)

First Part:	Second Part:	Third Part:
$\begin{array}{cc} a & b \\ c & d \end{array}$	$\begin{array}{cc} a & b \\ c & d \end{array}$	$\begin{array}{cc} a & b \\ c & d \end{array}$
(a×c)	(a×d + b×c)	(b×d)

Ex.1: (x+3) (x+5)	Ex.2: (x+3) (x-5)	Ex.3: (x-3) (x-5)
$\begin{array}{cc} 1 & 3 \\ 1 & 5 \end{array}$	$\begin{array}{cc} 1 & 3 \\ 1 & -5 \end{array}$	$\begin{array}{cc} 1 & -3 \\ 1 & -5 \end{array}$
$\begin{array}{c} \text{-----} \\ (1 \times 1) (1 \times 5 + 1 \times 3) (3 \times 5) \\ 1 8 15 \\ x^2 + 8x + 15 \end{array}$	$\begin{array}{c} \text{-----} \\ (1 \times 1) (1 \times -5 + 1 \times 3) (3 \times -5) \\ 1 -2 -15 \\ x^2 - 2x - 15 \end{array}$	$\begin{array}{c} \text{-----} \\ (1 \times 1) (1 \times -5 + 1 \times -3) \\ (-3 \times -5) \\ 1 -8 15 \\ x^2 - 8x + 15 \end{array}$
$x^2 + 8x + 15$	$x^2 - 2x - 15$	$x^2 - 8x + 15$

Ex.4: (x+3) (x)	Ex.5: (-x+3) (-x+5)	Ex.6: (-x-3) (-x-5)
1 3	-1 3	-1 -3
1 0	-1 5	-1 -5
(1×1) (1×0+1×3)	(-1×-1) (-1×5+-	(-1×-1) (-1×-5+-
(3×0)	1×3) (3×5)	1×-3) (-3×-5)
1 3 0	1 -8 15	1 8 15
x ² +3x+0	x ² -8x+15	x ² +8x+15
x²+3x	x²-8x+15	x²+8x+15

CASE 2: (3×3; 3×2; 3×1)

First Part:	Second Part:	Third Part:	Fourth Part:	Fifth Part:
a b c	a b c	a b c	a b c	a b c
d e f	d e f	d e f	d e f	d e f
(a×d)	(a×e + b×d)	(a×f + b×e + c×d)	(b×f + c×e)	(c×f)

Ex.1: (x ² +5x+1) (3x ² -10x+15)	Ex.2: (2x ² -4x-7) (4x ² +20x-12)
1 5 1	2 -4 -7
3 -10 15	4 20 -12
(1×3) (1×-10+3×5)	(2×4) (2×20+4×-4) (2×-12+-
(1×15+5×-10+1×3) (5×15+-	4×20+4×-7) (-4×-12+20×-7)
10×1) (1×15)	(-7×-12)
3 5 -32 65 15	8 24 -132 -92 84
3x ⁴ +5x ³ -32x ² +65x+15	8x ⁴ +24x ³ -132x ² -92x+84
3x⁴+5x³-32x²+65x+15	8x⁴+24x³-132x²-92x+84

The greatest sin is to think that you are weak.--Swami Vivekananda

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