# ⚡ Vedic Maths Magic Tricks ⚡

Chapter 6: Vertically and Crosswise Multiplication

## The General Master Sutra: "Urdhva-Tiryagbhyam"

This is the ultimate, universal method for multiplying **any two numbers** of any digit length. The Sanskrit Sutra name is **"Urdhva-Tiryagbhyam"**, which translates directly to *"Vertically and Crosswise"*.

## ✨ Sanskrit Sutra: Urdhva - Tiryagbhyam (Vertically & Crosswise)

### 📐 Fundamental Movement Patterns

#### i) Vertical Product




Multiply vertically

#### ii) Cross Product




Multiply & add crosswise

#### iii) 3×3 Cross & Vertical




Full 3-digit symmetry

### 💡 Key Advantage: Single Line Answer

Unlike traditional long multiplication which requires multiple lines of intermediate products and additions, **Urdhva-Tiryagbhyam** generates the complete answer in **one single straight line** from right to left!

## Pattern 1: 2×2 Digit Multiplication & Alternate Method

### 📌 Eg-1: Standard Method (74 × 46)

Execute Right Vertical ➔ Crosswise Sum ➔ Left Vertical (carry over as needed):

- **Step 1 (Right Vertical):** 4 × 6 = **24** ➔ Write **4**, Carry 2
- **Step 2 (Crosswise Sum):** (7 × 6) + (4 × 4) + 2 = 42 + 16 + 2 = **60** ➔ Write **0**, Carry 6
- **Step 3 (Left Vertical):** (7 × 4) + 6 = 28 + 6 = **34** ➔ Write **34**

**➔ Combined Result: 34 | 0 | 4 = 3404**

### 📌 Eg-2: Alternate Method — "Inside-Outside Principle" (42 × 18)

Multiply **First by First** and **Last by Last**, then add Inside product + Outside product!

- **R.P (Right Product - Last × Last):** 2 × 8 = **16** ➔ Write **6**, Carry 1
- **I-O P (Inside-Outside Product):** (2 × 1) + (4 × 8) + 1 = 2 + 32 + 1 = **35** ➔ Write **5**, Carry 3
- **L.P (Left Product - First × First):** (4 × 1) + 3 = **7** ➔ Write **7**

**➔ Combined Result: 7 | 5 | 6 = 756**

# ✏️ Chapter 6 Exercises & Complete Solutions

### Multiply the following using Vertically and Crosswise:

| # | Problem | Step-by-Step Breakdown | Answer |
|---|---|---|---|
| 1 | **27 × 36** | R: 7×6 = 42 (Write 2, Carry 4)<br>C: (2×6)+(7×3)+4 = 12+21+4 = 37 (Write 7, Carry 3)<br>L: (2×3)+3 = 9 | **972** |
| 2 | **86 × 24** | R: 6×4 = 24 (Write 4, Carry 2)<br>C: (8×4)+(6×2)+2 = 32+12+2 = 46 (Write 6, Carry 4)<br>L: (8×2)+4 = 20 | **2064** |
| 3 | **47 × 39** | R: 7×9 = 63 (Write 3, Carry 6)<br>C: (4×9)+(7×3)+6 = 36+21+6 = 63 (Write 3, Carry 6)<br>L: (4×3)+6 = 18 | **1833** |
| 4 | **58 × 72** | R: 8×2 = 16 (Write 6, Carry 1)<br>C: (5×2)+(8×7)+1 = 10+56+1 = 67 (Write 7, Carry 6)<br>L: (5×7)+6 = 41 | **4176** |
| 5 | **63 × 95** | R: 3×5 = 15 (Write 5, Carry 1)<br>C: (6×5)+(3×9)+1 = 30+27+1 = 58 (Write 8, Carry 5)<br>L: (6×9)+5 = 59 | **5985** |

### 🌟 Chapter 6 Mastery Checklist

✅ **Sutra Concept:** Mastered *Urdhva-Tiryagbhyam* (Vertically & Crosswise).
✅ **3-Step Algorithm ($2\times 2$):** Right Vertical ➔ Crosswise Sum ➔ Left Vertical.
✅ **Inside-Outside Method:** First × First, Last × Last, and Inside + Outside sum.
✅ **Single Line Efficiency:** Answers computed directly in one straight line!