⚡ Vedic Maths Magic Tricks ⚡

Chapter 12: Cubes of Any 2-Digit Number

1. The Proportionally Method (Anurupyena)

💡 Algebraic Foundation

To calculate the cube of a two-digit number **'ab'**, we expand the standard algebraic identity:

$$(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

Splitting the middle terms $3a^2b = (a^2b + 2a^2b)$ and $3ab^2 = (ab^2 + 2ab^2)$ gives us two rows:

a^3	a^2b	ab^2	b^3
+	$2a^2b$	$2ab^2$	

🔗 The Geometric Ratio Rule

Notice how each term in the first row is derived from its predecessor by multiplying by the common ratio **r = (b / a)**:

- **I Term:** a^3
- **II Term:** $a^3 \times (b/a) = \mathbf{a^2b}$
- **III Term:** $a^2b \times (b/a) = \mathbf{ab^2}$
- **IV Term:** $ab^2 \times (b/a) = \mathbf{b^3}$

So we only need to calculate a^3 and ratio (b/a). The rest of the terms flow naturally!

2. Worked Example 1: Cube of 12

📌 Eg-1: Find 12^3 (a = 1, b = 2)

- **Ratio (b / a):** 2 / 1 = **2**
- **Step 1 (First Row):**
  - I Term = 1^3 = **1**
  - II Term = 1 × 2 = **2**
  - III Term = 2 × 2 = **4**
  - IV Term = 4 × 2 = **8**
- **Step 2:** Double terms II & III (4 and 8) and add up!

1	2	4	8
	4	8	
1	**7**	**2**	**8**

(Carry +1 from 4+8=12)

∴ $\mathbf{12^3}$ = **1728**

3. Worked Example 2: Cube of 43

📌 Eg-2: Find 43 3 (a = 4, b = 3)

- **Ratio (b / a): 3 / 4**
- **Step 1 (First Row):**
  - I Term = 4^3 = **64**
  - II Term = 64 × (3/4) = **48**
  - III Term = 48 × (3/4) = **36**
  - IV Term = 36 × (3/4) = **27**
- **Step 2 (Double II & III and add with carryover):**

64	48	36	27
	96	72	
64	144	108	27
(+15)	(+11)	(+2)	
79	**5**	**0**	**7**

∴ 43^3 = **79,507**

4. Worked Example 3: Cube of 68

📌 Eg-3: Find 68 3 (a = 6, b = 8)

- **Ratio (b / a):** 8 / 6 = **4 / 3**
- **Step 1 (First Row):**
  - I Term = 6^3 = **216**
  - II Term = 216 × (4/3) = **288**
  - III Term = 288 × (4/3) = **384**
  - IV Term = 384 × (4/3) = **512**
- **Step 2 (Double II & III and add with carryover):**

216	288	384	512
	576	768	
216	864	1152	512
(+98)	(+120)	(+51)	
314	**4**	**3**	**2**

∴ 68^3 = **314,432**

5. Exercise Problems & Detailed Solutions

#	Problem	Ratio (b/a)	First Row Terms	Middle Doubled & Sum Calculation	Final Cube
1	$\mathbf{26^3}$	6 / 2 = 3	8, 24, 72, 216	8 | 24(+48=72) | 72(+144=216) | 216 Carry additions: 216→+21; 237→+23; 95→+9	**17,576**
2	$\mathbf{34^3}$	4 / 3	27, 36, 48, 64	27 | 36(+72=108) | 48(+96=144) | 64 Carry additions: 64→+6; 150→+15; 123→+12	**39,304**
3	$\mathbf{53^3}$	3 / 5	125, 75, 45, 27	125 | 75(+150=225) | 45(+90=135) | 27 Carry additions: 27→+2; 137→+13; 238→+23	**148,877**
4	$\mathbf{82^3}$	2 / 8 = 1/4	512, 128, 32, 8	512 | 128(+256=384) | 32(+64=96) | 8 Carry additions: 8→+0; 96→+9; 393→+39	**551,368**
5	$\mathbf{91^3}$	1 / 9	729, 81, 9, 1	729 | 81(+162=243) | 9(+18=27) | 1 Carry additions: 1→+0; 27→+2; 245→+24	**753,571**

📌 Golden Rules for Cubing in One Line

1. Always set up the first digit cube $\mathbf{a^3}$ and common ratio **r = b/a** first.
2. Multiply each term sequentially by **r** to get 4 terms in geometric progression.
3. Double only the 2 middle terms, sum each column, and push carryovers strictly right-to-left.

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