

Magical Rule For Number System Part 01

Magical Rule No.1

'With Power Rule'

Unchangeable digits

(अपरिवर्तनीय अंक)

0, 1, 5, 6

Unit digits

0 1 5 6

1). $(7835)^{1739}$

\Rightarrow Unit digit = 5

2). $(87396)^{1997}$

\Rightarrow Unit digit = 6

Magical Rule No.2

Numbers	Power form	No. of digits = power+1
10	10^1	$1 + 1 = 2$
100	10^2	$2 + 1 = 3$
1000	10^3	$3 + 1 = 4$
10000	10^4	$4 + 1 = 5$
100000	10^5	$5 + 1 = 6$

Ex. $4^{2222} \times 5^{4444}$

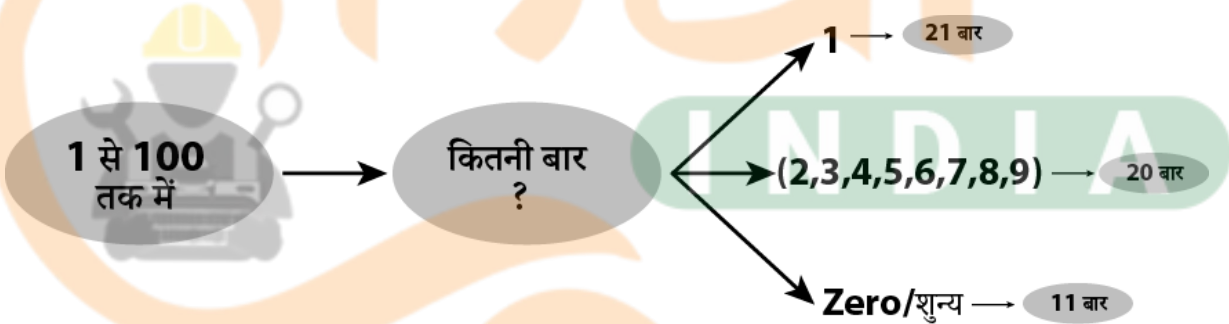
$$\begin{aligned} & 4^{2222} \times 5^{4444} \\ &= (2^2)^{2222} \times 5^{4444} = 2^{4444} \times 5^{4444} \\ &= (2 \times 5)^{4444} = 10^{4444} \end{aligned}$$

• Total digits = $4444+1$
= **4445**

Magical Rule No.3

Digits Appearance

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



Ex. How many times the digit 5 will appear while writing the integers from 1 to 1000? (यदि 1 से 1000 तक के पूर्णाकों को लिखा जाए तो अंक 5 कितनी बार आएगा?)

1 → 100 → 20	501 → 600 → 20 + 99
101 → 200 → 20	601 → 700 → 20
201 → 300 → 20	701 → 800 → 20
301 → 400 → 20	801 → 900 → 20
401 → 500 → 21	901 → 1000 → 20
101	199
$\underbrace{\hspace{10em}}_{+}$	
300	

Magical Rule No.4

'Formula' Rule

- **Sum of first 'n' natural numbers** (प्रथम 'n' प्राकृत संख्याओं का योग)

$$1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$$

Ex. $\frac{1+2+3+4+\dots+99}{10} = \frac{99 \times 100}{2 \times 10} = 495 \rightarrow$

unit digit = 5

- **Sum of the squares of first 'n' natural numbers** (प्रथम 'n' प्राकृत संख्याओं के वर्गों का योग)

$$1^2 + 2^2 + 3^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$$

Ex. $1^2 + 2^2 + 3^2 + \dots + 72^2$

$= \frac{72 \times 73 \times 145}{6} \Rightarrow \text{unit digit} = 0$

- **Sum of the cubes of first 'n' natural numbers** (प्रथम 'n' प्राकृत संख्याओं के घनों का योग)

$$1^3 + 2^3 + 3^3 + \dots + n^3 = \left(\frac{n(n+1)}{2}\right)^2 = \frac{n^2(n+1)^2}{4}$$

Ex. $1^3 + 2^3 + 3^3 + \dots + 87^3$

$= \left(\frac{87 \times 88}{2}\right)^2 \Rightarrow 8^2 \rightarrow \text{unit digit} = 4$