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Number system

1) Integer → $-\infty$ 0 $+\infty$

+ve integer → +1 $+\infty$

-ve integer → -1 $-\infty$

★★★ zero is neither +ve nor -ve

2) Natural number → 1 ∞

Whole number → 0 ∞

★★★ All natural numbers are whole numbers

3) Even number → 0 2 4 6 8 .... ∞

odd number → 1 3 5 7 9 .... ∞

Consecutive even no → x $x+2$ $x+4$ .... ∞

Consecutive odd no → x $x+2$ $x+4$ .... ∞

4) Prime number → 2 3 5 7 11 13 .... ∞

2 → only one even prime

3 5 7 11 13 .... ∞ → odd prime

★★★ Every prime number has only two factors → 1 & no. itself

Ex $2 = 1\times2$ $191 = 1\times191$

$5 = 1\times5$ $41 = 1\times41$

Composite number → 4 6 8 9 10 12 .... ∞

★★★ Composite number has more than two factors.

Ex $91 = 1\times13\times7$ $111 = 1\times3\times37$

5) Co-prime numbers → Two numbers are co-prime numbers only if their HCF = 1

Ex

$2 = 1\times2$	$21 = 1\times7\times3$	$9 = 1\times3\times3$
$3 = 1\times3$	$90 = 1\times2\times3\times3\times5$	$8 = 1\times2\times2\times2$
HCF = 1	HCF = $1\times3 = 3$	HCF = 1
∴ 2, 3 = ✓	∴ 21, 90 = ×	9, 8 = ✓

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Divisibility test

1) 2 ⇒ last digit of that number must be zero or divisible by 2
4 ⇒ last two digits of that number must be divisible by 4
8 ⇒ last three digits of that number must be divisible by 8

2) 3 ⇒ sum of all digits of that number must be divisible by 3
9 ⇒ sum of all digits of that number must be divisible by 9

3) 6 ⇒ number must be divisible by 2 and 3

4) 5 ⇒ number must have 0 or 5 at it's unit place.
10 ⇒ number must have 0 at it's unit place.

5) 11 ⇒ sum of even placed digits − sum of odd placed digits = 0 or multiple of 11

6) 12 ⇒ Number must be divisible by 3 & 4.

7) 7, 13, 17, 19 ⇒ Direct divide that number

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★ Surds and indices

1) $a^x \times b^x = (a \times b)^x$

2) $\frac{a^x}{b^x} = \left(\frac{a}{b}\right)^x$

3) $a^x \times a^y = a^{x+y}$

4) $\frac{a^x}{a^y} = a^{x-y}$

5) $(a^x)^y = a^{x \times y}$

6) $\sqrt[y]{(a^x)} = a^{x/y}$

★ Series

$1+2+3+4+\cdots\cdots+n \Rightarrow n(n+1)/2$

$1^2+2^2+3^2+4^2+\cdots\cdots+n^2 \Rightarrow n(n+1)(2n+1)/6$

$1^3+2^3+3^3+4^3+\cdots\cdots+n^3 \Rightarrow [n(n+1)/2]^2$

★ Arithmatic progeation

$a \quad a+d \quad a+2d \quad a+3d \quad \cdots\cdots$

sum $= [2a+(n-1)d]\,n/2$

or

sum $= (a+l)\,n/2$

Last term $= a+(n-1)d$

where, a - first term
d - difference
l - last term
n - total no. of terms

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★ Number terms

10^3 > Thousand	⇒ 1000		10^3 > Thousand	⇒ 1000	
	+2			+3	
10^5 > Lakh	⇒ 1000,00		10^6 > Million	⇒ 1000,000	
	+2			+3	
10^7 > Crore	⇒ 1000,00,00		10^9 > Billion	⇒ 1000,000,000	
				+3	
			10^{12} > Teillion	⇒ 1000,000,000,000	

★ Algebraic formulas

$a^2+b^2 = (a+b)^2-2ab$ or $(a-b)^2+2ab$

$a^2-b^2 = (a+b)(a-b)$

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

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

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

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

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

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

NO	squares	cubes	fraction	decimal	percentage
1	1	1	1/1	1	100%
2	4	8	1/2	0.50	50%
3	9	27	1/3	0.33	33.33%
4	16	64	1/4	0.25	25%
5	25	125	1/5	0.20	20%
6	36	216	1/6	0.16	16.66%
7	49	343	1/7	0.14	14.28%
8	64	512	1/8	0.125	12.5%
9	81	729	1/9	0.11	11.11%
10	100	1000	1/10	0.10	10%
11	121	1331	1/11	0.09	9.09%
12	144	1728	1/12	0.08	8.33%
13	169	2197	1/13	0.07	7.69%
14	196	2744	1/14	0.07	7.14%
15	225	3375	1/15	0.06	6.66%
16	256	4096	1/16	0.06	6.25%
17	289	4913	1/17	0.05	5.88%
18	324	5832	1/18	0.05	5.55%
19	361	6859	1/19	0.05	5.26%
20	400	8000	1/20	0.05	5%

Finding Square root and Cube root (Perfect numbers)

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unit digit ⇒	1	2	3	4	5	6	7	8	9
Sq. Root ⇒	1,9	×	×	2,8	5	6,4	×	×	3,7
cube Root ⇒	1	8	7	4	5	6	3	2	9

Perfect square Root

1) $6241 \begin{matrix} \nearrow 1 \\ \searrow 9 \end{matrix}$

79 $7 \times 8 = 56$

2) $11236 \begin{matrix} \nearrow 6 \\ \searrow 4 \end{matrix}$

106 $10 \times 11 = 110$

3) $16384 \begin{matrix} \nearrow 2 \\ \searrow 8 \end{matrix}$

128 $12 \times 13 = 156$

4) $24649 \begin{matrix} \nearrow 3 \\ \searrow 7 \end{matrix}$

157 $15 \times 16 = 240$

5) $1296 \begin{matrix} \nearrow 6 \\ \searrow 4 \end{matrix}$

36 $3 \times 4 = 12$

6) $79524 \begin{matrix} \nearrow 2 \\ \searrow 8 \end{matrix}$

282 $28 \times 29 = 812$

7) $61009 \begin{matrix} \nearrow 3 \\ \searrow 7 \end{matrix}$

247 $24 \times 25 = 600$

8) $44944 \begin{matrix} \nearrow 8 \\ \searrow 2 \end{matrix}$

212 $21 \times 22 = 462$

9) $21025 \rightarrow 5$

145

Perfect cube Root

1) $205379 \rightarrow 9$

59

2) $912673 \rightarrow 7$

97

3) $314432 \rightarrow 8$

68

4) $6229504 \rightarrow 4$

184

5) $9393931 \rightarrow 1$

211

6) $11697083 \rightarrow 7$

227

7) $5177717 \rightarrow 3$

173

8) $857375 \rightarrow 5$

95

9) $42875 \rightarrow 5$

35