



SSC-CGL

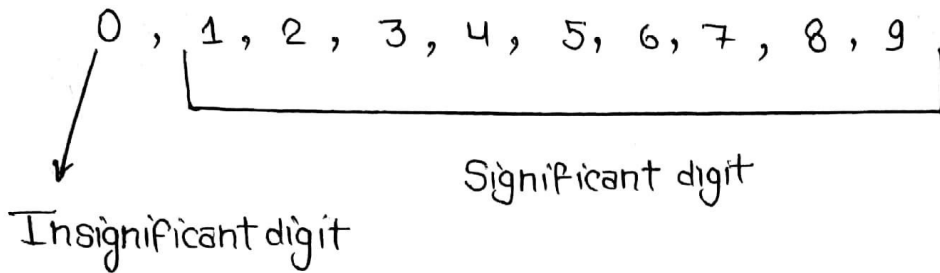
COMBINED GRADUATE LEVEL

QUANTITATIVE APTITUDE - II
(ADVANCE MATHS)

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NUMBER SYSTEM



Natural No-

$$N = [1, 2, 3, 4, 5, \dots, \infty]$$

Whole No-

$$W = [0, 1, 2, 3, 4, \dots, \infty]$$

Integer No-

$$I = -\infty \text{ to } +\infty$$

$$= [-\infty, \dots, -3, -2, -1, 0, 1, 2, 3, \dots, \infty]$$

Even Number-

The number which is divisible by 2 is called even no.

or

Even number Contains unit digit 0, 2, 4, 6, 8

eg:- 2, 4, 6, ..., 1972, 2008

Odd Number-

The number which are not divisible by 2.

or

Odd no's Contain Unit digit 1, 3, 5, 7, 9.

eg:- 1, 3, 5, 7, ..., 1983, 2005, 2115.

Note:- 0 is neither Odd or even .

Prime Number:-

The number which is not divisible by any other number except 1 and onself.

- 2 is the Only even prime number.
- First Prime number - 2
- Prime number from 1 to 100 = 25

Prime number from 1 to 75 = 21

Prime number from 1 to 50 = 15

Prime number from 1 to 25 = 09

Que:- How many Prime numbers are there from 1 to 105 ?

Soln:- From 1 to 100 , Prime number = 25

From 101 to 105 , Prime numbers = 101, 103

Total Prime numbers = $25 + 2 = 27$

Composite Number

The number which can be divided by any other number is called Composite number.

- 0 and 1 are neither Prime number nor Composite number.

Co-Prime Number

The number which are not divisible by each other.

eg:- • (3, 4)
• (3, 4, 6)

- HCF of Co-Prime numbers be always 1.

Rational Number -

- 0 is a rational Number.
- $\frac{a}{b}$, $b \neq 0$ a and b both are integers.
- All the numbers which can be written in the form of $\frac{a}{b}$ is rational number but only condition is $b \neq 0$

eg: $\frac{3}{1}$, $\frac{0}{1}$, -1

- All the natural no, whole no, Integer no's are rational no's but vice-versa is not true.
- If no. of decimal digit are finite in any number then the no will be rational.

$$\begin{array}{r} 3.5 \\ \times 10 \\ \hline 35 \end{array}$$

$$\begin{array}{r} 8.73 \\ \times 100 \\ \hline 873 \end{array}$$

- $44444 \dots \infty = .\overline{4} = \frac{4}{9}$
- $838383 \dots \infty = .\overline{83} = \frac{83}{99}$

If repetition occurs in finite way after the decimal then they can be called rational numbers.

- $2\sqrt{25}$, $3\sqrt{27}$, $6\sqrt{64}$

All the no's of which we can find out complete square root is called rational no.

Irrational no's -

All the no's which can't be written in the form of rational no is called irrational no's.

- $0.123486784 \dots \infty$
- $\sqrt{2}$, $\sqrt{3}$
- π - Irrational no.
- $\frac{22}{7}$ - rational no.

Rules of divisibility -

- • If Unit digit is 0 then divisible by 5 → eg: 2870
- If last two digit are 00 then divisible by 25. eg - 16900
- If last three digits are 000 then divisible by 125.

→ Rule of 3 and 9:-

The Sum of digit should be divisible by 3 and 9.

eg: 7832211

$$7+8+3+2+2+1+1 = 24$$

divisible by Only 3.

eg: 7833213

$$7+8+3+3+2+1+3 = 27$$

divisible by both 3 and 9.

Rule of 6:-

Rule of 2 and 3 both are applied

eg: 23412

$$2+3+4+1+2 = 12 \rightarrow \text{divisible by 3.}$$

$$23412 \rightarrow \text{divisible by 2.}$$

eg: $72 * 72$, if given number is divisible by 9 then find the possible value of $*$?

Soln:- min Possible Values are Only 0 and 9.

eg: What is the minimum number found by Only 0 and 1 which is Completely divisible by 225?

Soln:- $225 = 25 \times 9$

Rule of 25 and 9 should be applied.

$$= 11111111100$$

→ Rule of 2, 4, 8:-

- If unit digit is divisible by 2 then number be divisible by 2. eg:- 2874
- If last two digit are divisible by 4 then number be divisible by 4. eg:- 16924
- If last three digits are divisible by 8 then number be divisible by 8. eg - 176864

Rule of 11.

Difference of even place and Odd Place should be divisible by 11.

eg: If 7 38 A 6 A is Completely divisible by 11 then And the Value of A ?

Soln:- even Place of number - Odd Place of Number

$$(A + A + 3) - (6 + 8 + 7) = 0$$

$$2A - 18 = 0$$

$$A = 9$$

eg: Is 361658 divisible by 11 ?

Soln:- $(8 + 6 + 6) - (5 + 1 + 3)$

$$20 - 9 = 11$$

11 is divisible by 11 so yes, it is divisible.

Test of Unit digit:-

Multiplication:

eg:

783	x	694	x	897	x	386
↓		↓		↓		↓
3	x	4	x	7	x	6
$1 \text{ (2)} \quad 2 \times 7 = 1 \text{ (4)} \quad 4 \times 6 = 2 \text{ (4)}$						

So, Unit digit is 4.

eg: $879 \times 637 \times 583 \times 985$

- (If at least One '5' x all odds = Unit digit = 5)

$$\begin{array}{cccc}
 879 & \times & 637 & \times & 583 & \times & 985 \\
 \downarrow & & \downarrow & & \downarrow & & \downarrow \\
 9 & & 7 & & 3 & & 5 \\
 \text{Odd} & & \text{Odd} & & \text{Odd} & &
 \end{array}$$

answer is 5 -

eg: $878 \times 679 \times 383 \times 582 \times 685$

- (If at least One '5' x at least One even = Unit digit = 0)

Powers

- Whatever Power is Placed On 0, 1, 5, 6, Unit digit Will be Same 0, 1, 5, 6.

eg: $6156^{273} \rightarrow \text{Unit digit} = 6$ eg: $275^{2551} \rightarrow \text{Unit digit} = 5$

- $9^1 = 9$, $9^2 = 81$
 $9^3 = 729$, $9^4 = 6561$

9^{odd} then Unit digit $\rightarrow 9$

9^{even} then Unit digit $\rightarrow 1$

• $\therefore$ If x^n and $n > 4$

then do $\frac{n}{4}$, means divide to last two digit of n by 4.

If Remainder Power

1	1
2	2
3	3
0	4

eg: $(122)^{173}$

Soln:- $(122)^{\frac{173}{4}}$ $\geq$ Here remainder = 1 then Power 1
 $(122)^1 = 2^1 = \underline{2} = \text{Unit digit}$

eg: $6^{63} \times 7^{71} \times 3^{65}$

Soln:-

$6^{\frac{63}{4}}$	$\times$	$7^{\frac{71}{4}}$	$\times$	$3^{\frac{65}{4}}$
$\downarrow$		$\downarrow$		$\downarrow$
Any Power of 6 result 6		$\frac{71}{4} = 17$		$\frac{65}{4} = 16$
		remainder = 3		remainder = 1
$\downarrow$		$\downarrow$		$\downarrow$
6	$\times$	7^3	$\times$	3^1
$\downarrow$		$\downarrow$		$\downarrow$
6	$\times$	3	$\times$	3
$6 \times 3 = 18$ $8 \times 3 = 24$				
$\rightarrow \text{Unit digit.}$				

eg:- $124^{372} + 124^{373}$, What would be Unit digit of given data?

Soln = $124^{372} + 124^{373}$
 $= 124^{\frac{72}{4}} + 124^{73/4}$
 $\downarrow \qquad \qquad \downarrow$
 $4^4 + 4^1$
 $\downarrow \qquad \qquad \downarrow$
 $6 + 4 = 10 \rightarrow \text{Unit digit} = 0$

eg:- $3^{108} - 8^{34}$, Unit digit = ?

Soln:- $3^{108} - 8^{34}$
 $\downarrow \qquad \qquad \downarrow$
 $3^4 = 81 \quad 8^2 = 64$
 $\downarrow \qquad \swarrow \quad \nwarrow$
 $1 \quad - \quad 4$
 $= 11 - 4 = 7 \rightarrow \text{Unit digit}$
 $\downarrow$
 (take Carry)

eg:- Number at Zero's;

$$5 \times 2 = 10$$

$$5 \times 2 \times 5 \times 2 = 100$$

$$5 \times 2 \times 5 \times 2 \times 5 \times 2 = 1000 \dots \dots \text{etc.}$$

eg: Find the number of zero's in the end of
given multiple $1 \times 2 \times 3 \times 4 \times \dots \times 1000$

Soln:- First find the number of factors of 5 because
no. of '2' are a lot

$$\text{Factors of 5} = \frac{1000}{5} \text{ (last number)} = 200$$

$$\frac{200}{5} = 40$$

$$\frac{40}{5} = 8$$

$$\frac{8}{5} = 1$$

$$\hline 249$$

$$\text{Factors of 5} = 249$$

Factors of 2 = more (than 249 (can understand by
given data)

then these are 249 zero's.

eg: Find the numbers of zero's in the end given multiplication?

$$1 \times 2 \times 3 \times 4 \times \dots \times 100$$

Soln:- Factors of 5 = $\frac{100}{5}$ (last no) = 20

$$\frac{20}{5} = 4$$

$$\text{Factors of 5} \rightarrow 24$$

$$\text{Factors of 2} \rightarrow \text{more than 24}$$

24 Pairs

So Zero's are 24.

Eg: Find the number of Zero's in the End of given multiplication?

$$1 \times 3 \times 5 \times 7 \times 9 \times \dots \times 99$$

Soln:- Factor of 5 = 12

Factor of 2 = 0 (there is no even no so there is no pair)

So no. of Zeros are '0'

⇒ No of Completely divisible-

Que:- How many natural numbers between 3 to 200 Completely divisible by 7.

Soln:- $\frac{3}{7} \quad \frac{200}{7}$

Quotient 0 28

$$28 \times 7 = 196 \quad 28 \times 7 = 196 \checkmark$$

∴ Note — If the first number, divisor the given number Completely then add '1' in difference.

Que:- How many three digit numbers are there Completely divisible by 6?

Soln:- $\frac{100}{6} \quad \frac{999}{6}$

16 166

$$166 - 16 = 150$$

Que:- Numbers of numbers below 1000 which are divisible by 10 and 13 both?

Soln:- LCM of (10, 13) = 130

$$\begin{array}{r} 0 \\ 130 \end{array} \quad \begin{array}{r} 999 \\ 130 \end{array}$$

$$\begin{array}{c} 0 \quad \quad 7 \\ \quad \quad \quad \curvearrowright \\ 7 - 0 = 7 \end{array}$$

⇒

Dividen	Divisor	Remainder
998		
99	97	1
998		
98	99	1
1073		
89	88	1
987		
79	80	79

If difference of base of dividend and divisor is 1 then.

(a) When Power is even then remainder = 1

(b) When Power is Odd then remove the Power and divide.

Que:- What is the remainder after dividing 5^{11} by 126?

Soln:- $5^{11} \div 126$

$$\downarrow$$

$$(5^3)^{37} = 125^{11} \div 126$$

$$\text{Remainder} = 125$$

Q → What is the remainder after dividing $(9^{19} + 6)$ by 8?

Soln:-

$$\begin{aligned}
 &= (9^{19} + 6) \div 8 \\
 &= \left(\frac{9^{19}}{8} + \frac{6}{8} \right) \\
 &= 1 + 6 = 7
 \end{aligned}$$

Que:- What is the remainder after dividing 2^{33} by 10?

Soln:- $= 2^{33} \div 10$

$$\begin{array}{r}
 \downarrow \frac{33}{4} \\
 2^4
 \end{array}$$

$$\downarrow 1$$

$$2 \div 10 \text{ then remainder} = 2$$

⇒ Divisor $\overline{) \text{Dividend}}$ Quotient Divident = divisor = divisor $\times$ quotient + remainder

eg: Divide 27 by 6?

Soln:-

$$\begin{array}{r}
 \text{Divisor} \rightarrow 6 \overline{) 27} \leftarrow \text{dividend} \\
 \underline{24} \\
 3 \text{ --- Quotient} \\
 \underline{3} \text{ --- remainder}
 \end{array}$$

Que:- When a number is divided by 3- remainder is 1. When the quotient of it divided by 2 then remainder is 1. If the Initial number is divided by 6 then what is the remainder.

Soln:-

$$\begin{array}{r}
 \text{Divisor} \quad 3 \times 3 = 9 \\
 + 3 \times 2 \\
 \hline
 \text{Remainder} \quad \underline{1} \quad \downarrow + \\
 9 + 1 = 10 \quad \underline{3}
 \end{array}$$

Initial number = 10

then $10 \div 6 = 4$

Que:- In a divide, divisor is 10 times of it's quotient
 5 times of its remainder. If remainder is 46 then
 What is the dividend?

Soln:- Remainder = 46
 Divisor = $46 \times 5 = 230$
 Quotient = $\frac{230}{10} = 23$

$$\begin{aligned} \text{Dividend} &= \text{divisor} \times \text{Quotient} \times \text{Remainder} \\ &= 230 \times 23 \times 46 \\ &= 5336 \end{aligned}$$

Que:- If any number is Succieinly dividend by 4, 5, 6 then
 remainders are 2, 3, 4 resspectively. What is this Smallest
 numbers?

Soln:- Method-1

$53 \times 4 = 212$

Divisor $\rightarrow$

4	+	5	+	6
↓		↓		↓
2		3		4
↓		↓		↓
12		15		24
+ 2		+ 3		+ 4
= 24		= 53		= 28

$\times 10$
 $= 214$

∴ { Add Vertically then
 multiply the result
 in Cross, again add
 Vertically and multiply
 in Cross, So on.

Method-2

Do any options