1. Number System

Real numbers are classified into two domains namely rational and in rational number

i) Rational Number:-

It can be represented of the form P/q such that $q \neq 0$

Eg: $\frac{1}{2} \Rightarrow 0.5$ (Terminating)

$\frac{1}{3} = 0.33$ (Non-Terminating & Re-Curring)

$\sqrt{4}, \sqrt{9}, \sqrt{16} \Rightarrow$ Perfect Square

∴ All Perfect Squares are rational numbers

* All the Integers including '0' are rational number

∵ for Rational form $(P/q) \Rightarrow P = 0, q = 1$

$0/1 = 0$ ∴ finite answer.

Hence rational, number can be either be Terminating or non-terminating & if it is non-terminating it must be recurring

Eg: $\frac{1}{3} = 0.333$ ✓ $\frac{22}{7}, 3.157 \cdots$ ✗

ii) In-Rational Number:-

It cannot be represented of the form P/q Such that $q \neq 0$

Eg:- $\sqrt{2}, \sqrt{3}, \sqrt{6}, \sqrt{5}, \sqrt{7}$ etc (ie) Square root all imperfect square is an example of in-national

Ex: $\sqrt{2} = 1.414 \Rightarrow X$ (In-national)

$\sqrt{3} = 1.732$ $\qquad \pi = 3.14$ etc

2. Unit Digit

$(0)^{+2} = 0 \Rightarrow$ unit digit last digit of a number

$(1)^{+2} = 1$ $\quad$ my $\quad (2)^{+2} = 2$

$(5)^{+2} = 5$ $\quad$ and for $\quad (6)^{+2} = 6$

$\therefore 1^2 = 1 \Rightarrow$ unit digit $= 1$

$5^1 = 5 \quad 5^2 = 25 \quad 5^3 = 125 \quad 5^4 = 625 \Rightarrow$ unit digit $= 5$

$6^1 = 6 \quad 6^2 = 36 \quad 6^3 = 216$ $\quad$ unit digit $= 6$

$1^0 = 1 \quad 2^0 = 1 \quad 7^0 = 1 \quad 9^0 = 1$ $\quad$ unit digit $= 1$

For Number, four

$4^1 = \textcircled{4} \quad 4^2 = 1\textcircled{6} \quad 4^3 = 6\textcircled{4} \quad 4^4 = 25\textcircled{6}$

for Power = odd unit digit = 4

for Power = even unit digit = 6

$4^2, 4^3$ Ends with 6, $\quad 4^1, 4^3$ Ends with 5

my for $\quad 9^1 = \boxed{9} \quad 9^2 = 8\textcircled{1} \quad 9^3 = 72\boxed{9} \quad 9^4 = 65\textcircled{1}$

for odd number unit digit = 9

for even number unit digit = 1

It can be represented in a table for other num.

Remain	1	2	3	4 or 0
2	2	4	8	6
3	3	9	7	1
7	7	9	3	1
8	8	4	2	6

$$4 \overline{)\,69\,}^{117}$$

Examples :-

i, find the Unit digit of $(2379676)^{99754}$

$\because$ last digit $= 6$ $\therefore$ Unit digit $= 6$,

for $0, 1, 5, 2, 6$ for these four cases the roll number is powered the Unit digit is always same

ii, $(2013)^{1999}$ $4^{odd} = 4$

$\therefore$ Unit digit $= 3$

iii, $(927473)^{2004}$

for 2, 3, 7, 8

Power % by 4 and R: Respective Unit digit

$2001 \% 4$ R: 2001 $\therefore$ R=1

for 3 if R=1 Unit digit = 3

iv, $N = 33^{43} + 43^{33}$

33^{43} 33^{33}

$\Rightarrow 3 + 3$ $\Rightarrow$ R=3, R=1

$\Rightarrow$ for 3 Remain =3 Ans =7

for 3 Remain =1 Ans =3

$7 + 3 = 10$ $\therefore$ Unit digit $= 0$.

$$4 \overline{)\,2001\,}^{500}$$
$$\underline{2000}$$
$$1$$

$$4 \overline{)\,43\,}^{10}$$

$$4 \overline{)\,33\,}^{8}$$
$$\underline{32}$$
$$1$$

$$\underset{4}{|} \quad \overset{412}{432} \quad \times \quad \overset{431}{449} \qquad \overset{77}{4\sqrt{311}} \qquad \overset{43}{4\sqrt{412}}$$

$$\begin{array}{c} \overset{211}{} \\ \overline{3!} \\ 24 \\ \overline{3} \end{array}$$

$$\overset{412}{2} \underset{9^{odd}}{\overset{}{\times}} \overset{431}{9} \qquad 2, R=0 \quad u\cdot Dig = 6 \qquad \overset{412}{\underline{412}}$$

$$= 9 \qquad 6*9 = 1\cancel{54} \qquad 5\,\textcircled{4} \qquad 0$$

$$\therefore \text{Unit digit} = 4.$$

V) find $\overset{169}{x = (164)} + \overset{337}{(333)} + - \overset{726}{(727)}$

$$\overset{169}{9} \quad \overset{337}{4} + \overset{726}{3} - 7$$

$$4 + 3 - \cancel{2} = 5 \qquad 4^{odd} = 4 \qquad \overset{84}{4\sqrt{337}}$$

$$\therefore 7, R=2 \quad u\cdot d = 9 \qquad \overset{181}{4\sqrt{726}} \quad \overset{32\downarrow}{17} \quad 203$$

$$4+3-9 = -2 \qquad \overset{43}{\underline{}} \quad \overset{164\sqrt{812}}{} $$

$$\therefore \text{unit digit can't be negative} \qquad 32 \qquad \overset{I}{} \quad 8\downarrow\downarrow$$

$$\text{Subtracting from Ten's} \quad 10-2 = 8 \qquad \overset{32\downarrow}{} \quad \overset{012}{}$$

Vii) $\overset{413}{(217)} \times \overset{549}{(819)} \times \overset{624}{(413)} \times \overset{812}{(343)} \quad \overset{0\cdot6}{} \quad \overset{12}{0}$

$$\overset{6}{812} \quad \overset{4}{\underline{}}$$

$$\Rightarrow \overset{413}{7} \times \overset{549}{9} \times \overset{624}{4} \times \overset{412}{2} \qquad 9^{odd} = 9 \qquad \overset{103}{4\sqrt{413}}$$

$$\Rightarrow 7 \times 9 \times 6 \times 6 \qquad 4^{even} = 6 \qquad 4\downarrow\downarrow$$

$$\Rightarrow \underset{63}{} \underset{18}{} \underset{48}{} \qquad \overset{013}{}$$

$$\therefore \text{unit digit} = 8 \qquad \overset{12}{\underline{1}}$$

Viii) $\overset{827}{(8735)} + \overset{469}{(693)} \times \overset{1256}{(7339} - 2\overset{311}{44}) \qquad 19.$

$$\times (5827) \, 935 \qquad 3\sqrt{569}$$

$$\Rightarrow \overset{827}{(5} + \overset{469}{3}) \times \overset{1256}{(9} - \overset{311}{4}) \times 7 \qquad \overset{935}{235} \quad \overset{3\downarrow\downarrow}{069}$$

$$\Rightarrow (5+3) \times (9-4) \times 3 \qquad 4\sqrt{935}$$

$$\overset{86}{\underline{}}$$

$$R=3 \quad 13\downarrow$$

$$13.5$$

$8 x -3 x +3$:   ∴ Subract from 10s

$8 \times 10 - 3 \times 3$ $8 \times 7 \times 3$

                $\underline{56}$ $\underline{1}8$ $u \cdot d = 8$

∴ Unit digit $= 8$,

ix) find u·d of $12^m \times 18^n \times 25^1 \times 35^3$

$2^m \times 8^n \times 5^x \times 5^y$ ∴ last $= 5$

even if m, n, x has any value

5 Power anything becomz 5 ∴ Here even combi

       $5 \times 2 = 1\underline{0}$, $5 \times 4 = 2\underline{0}$, $5 \times 6 = 30$

∴ Unit digit $= 0$,

x) find the u·dig of 1 to 9999? ⇒ Product

    $2 \times 3 \times 5 \times 7 \times 11 \cdots 9999$ unit digit $= ?$

        6   0   0   0

∴ $6 \times 5 = 3\underline{0}$ ∴ Unit digit $= 0$.

xi) find the unit digit of $7777^{666} + 555^{333} + 888^{222}$
$+ 444^{666} + 111^{444} + 222^{777}$

⇒ $7^{666} + 5^{333} + 8^{222} + 4^{666} + 1^{444} + 2^{777}$

⇒ $9 + 5 + 4 + 6 + 1 + 2$ ∴ Unit
                             digit $= 7$,

⇒ 27   ∴ unit digit $= \underline{7}⓪$

(side calculations, right margin)

199
4)⎺7⎺7⎺
  4
  3 7

3 6 0
  17

18
4)⎺6⎺2⎺6⎺
  4
  3 7
  3 6
  7 ⁶
  7 6
  0