



CLAT-UG

COMMON LAW ADMISSION TEST

ELEMENTARY MATHEMATICS

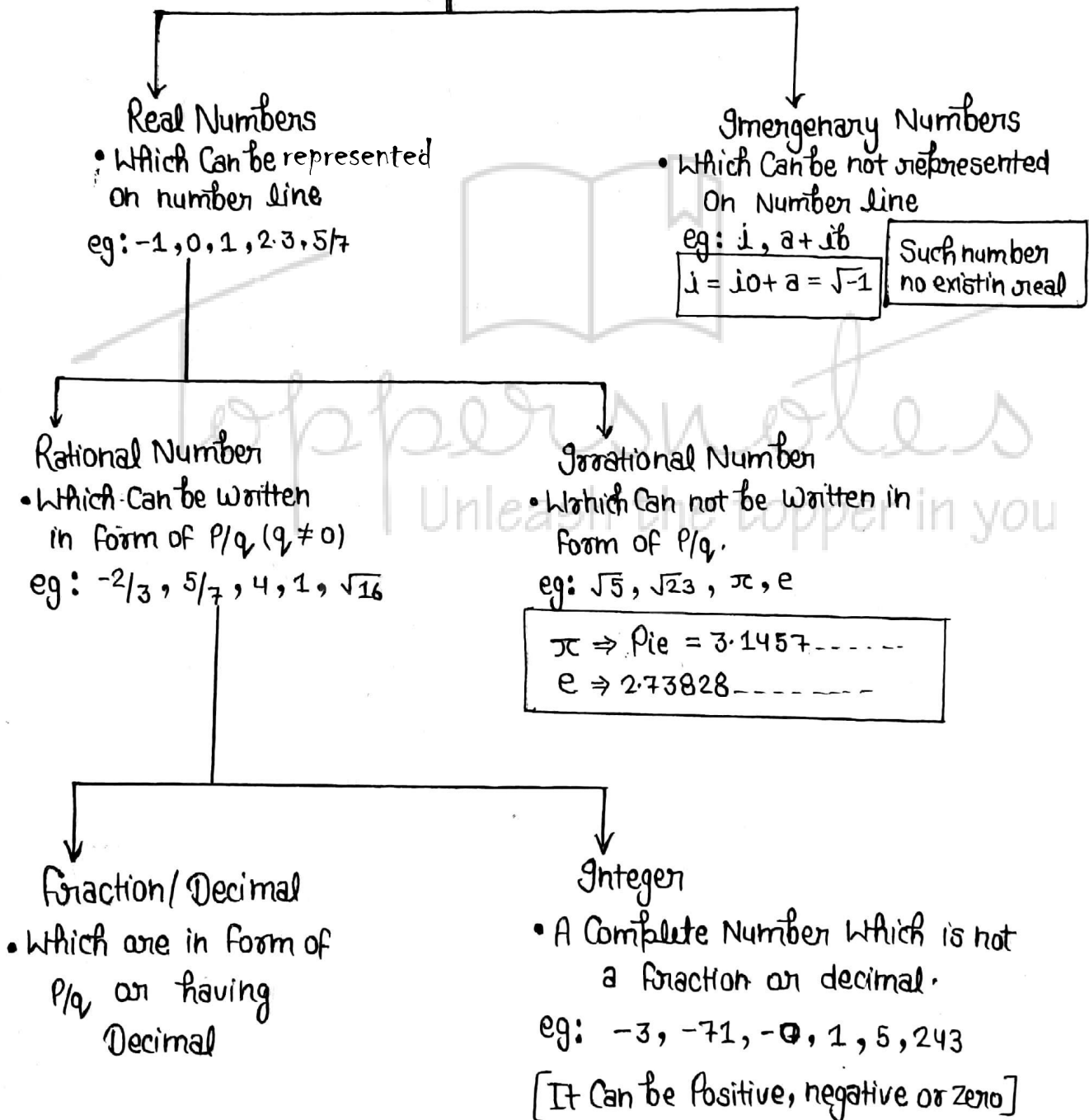
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NUMBER SYSTEM

Introduction

Numbers



- Whole Numbers: Integers Starting from 0.
- Natural Numbers: Integers Starting from 1.
- Prime Numbers: The number which is divisible by 1 & no. itself is called a Prime number.

eg: 2, 3, 5, 7, 11, 13 etc.

1 is not a Prime number

There are 25 Prime number b/w 1 to 100

- Composite Number: The number which have more than two factors are called Composite numbers.

eg: 4, 6, 12, 21, 28 etc.

The numbers which are not prime are Composite Number

Co-Prime Number: Numbers having their HCF is 1 are termed as Co-prime Numbers.

eg: 14 & 15.

Even Number: Rational number which are the multiple of 2 is called as even numbers.

eg: 2, 4, 6, 48, 92 ----- etc.

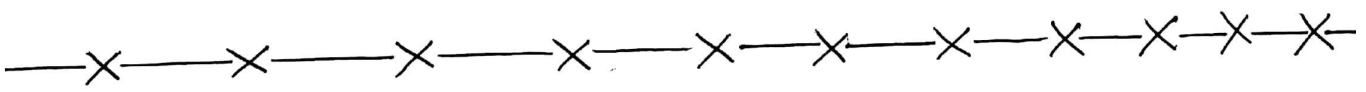
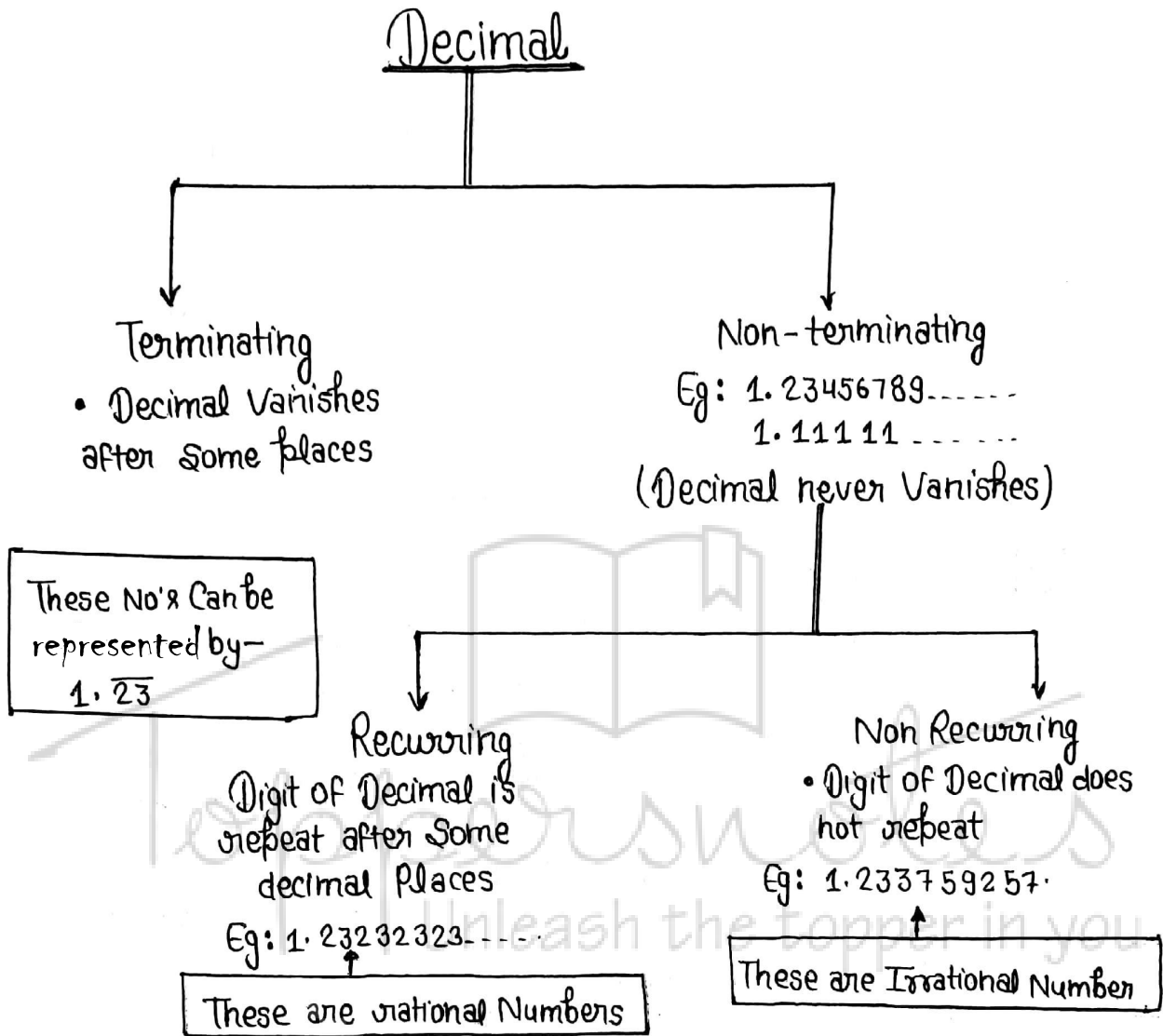
Odd Number: Rational Numbers which are not multiple of 2 are Odd Number.

eg: 1, 3, 5, 91, 103, 249 -----

even Numbers ending digit is 2, 4, 6, 8, 0 &
Odd Numbers ending digit is 1, 3, 5, 7, 9

Properties of Odd and even Numbers:

- even + even = Even
- ODD + ODD = Even
- Even + ODD = ODD
- Even + Even ----- + n times = Even (always)
- Odd + Odd ----- Odd numbers of times = ODD
- ODD + ODD ----- even number of times = Even
- Even x Even = Even
- Even x odd = Even
- Odd x odd = Odd
- Even x (Even / odd) = Even



Converting Recurring in P/q Form:

(Solving the - (Bar) Problems)

Eg: $x = 0.\overline{7}$, Convert it into P/q form.

Solⁿ ⇒ $x = 0.7777\dots$ — ①

$10x = 7.7777\dots$ — ②

$9x = 7.0000$

$x = 7/9$

-if (-) on one digit = multiply by 10
 -if (-) on two digit → multiply by 100

Tricks

Type-1

(a) $x = 0.\overline{8}$

$x = \frac{8}{9} \rightarrow$ As many digits contain ('-'), Write 9 as many times:-

(b) $x = 0.\overline{78}$

$x = \frac{78}{99} = \frac{26}{33}$ Ans

Type-II

(c) $x = 0.\overline{384}$

$= \frac{384-3}{990} \rightarrow$ Number After Decimal - Number not contain bar
 \rightarrow I as many digit in (-), & 0 as many times not contain (-),

$= \frac{381}{990} = \frac{127}{330}$ Ans

$x = \overline{5248}$

$= \frac{5248-52}{9900} = \frac{5196}{9900} = \frac{1732}{3300}$ Ans

Type-III

(a) $2.\overline{65}$

$\Rightarrow 2 + 0.\overline{65}$
 $= 2 + \frac{65-6}{90}$ (Same as type II)
 $= 2 + \frac{59}{90} = \frac{239}{90}$ Ans

(b) $5.\overline{95}$

$= 5 + 0.\overline{95}$
 $= 5 + \frac{95}{99}$
 $= \frac{590}{99}$

Divisibility Rules :-

NUMBER	RULE	EXAMPLE
2	Last digit is divisible by 2, or last digit is 0, 2, 4, 6, 8.	Eg: 2348 1948
3	Sum of digit is divisible by 3.	Eg: 1071 $1+0+7+1=9$
4	Last two digit of number is divisible by 4	14 <u>32</u> 92 <u>84</u>
5	Last digit is 5 or 0	2335, 1990
6	Number is divisible by 2 and 3 each	132 → divisible by 2 $1+3+2 \rightarrow$ divisible 3
7	<ul style="list-style-type: none"> • Multiply last digit by 5 • Add the above number • If remaining digits divisible by 7, then number is divided by 7 	Eg: 343 (i) $3 \times 5 = 15$ $34 - 15 = 19$ $19 - 14 = 5$ divisible by 7.
8	Last 3 digit are divisible by 8	8032 → 32 Divisible by 8.
9	Sum of digits is divisible by 9	1071 → $1+0+7+1=9$ divisible by 9
11	<ul style="list-style-type: none"> • Difference of Sum of digit at odd places & Sum of digit at even places. 	<ul style="list-style-type: none"> • <u>1331</u> $(3+1) - (3+1) = 0$ • 11718520 $(1+7+8+2) - (1+1+5+0) = 11$

② If $3x2680$, is divisible by 11, then the Value of x is :

Solⁿ: (Sum of Odd Place digit) - (Sum of Even Place digit)

$$= (3 + 2 + 8) - (x + 6 + 0)$$
$$= 13 - 6 - x$$
$$= 7 - x \text{ (Either 0 or divisible by 11)}$$
$$= 7 - x = 0$$

$x = 7$ Ans.

Cyclicity:

Unit digit is repeated after some time of an exponent.

$2^1 = 2$ $2^2 = 4$ $2^3 = 8$ $2^4 = 16$ $2^5 = 32$ $2^6 = 64$	$3^1 = 3$ $3^2 = 9$ $3^3 = 27$ $3^4 = 81$ $3^5 = 243$ $3^6 = 729$	$4^1 = 4$ $4^2 = 16$ $4^3 = 64$ $4^4 = 256$ Cyclicity = 2	$7^1 = 7$ $7^2 = 49$ $7^3 = 343$ $7^4 = 2401$ $7^5 = 16807$ Cyclicity = 4
Cyclicity = 4	Cyclicity = 4		
$8^1 = 8$ $8^2 = 64$ $8^3 = 512$ $8^4 = 4096$ $8^5 = 32768$	$9^1 = 9$ $9^2 = 81$ $9^3 = 729$ $9^4 = 6561$ Cyclicity = 2		
Cyclicity = 4			

Eg: $(2)^{423}$, Find the digit at units place

Soln (a) divide the power by 4

In Exams divide in mind, not in Pen-Paper.

$$\begin{array}{r}
 4 \overline{) 423} \quad (105 \\
 \underline{4} \\
 23 \\
 \underline{20} \\
 3
 \end{array}$$

Remainder = 3

$2^3 = 8$ Ans

Unit digit and ten's digit Concept-

★

1	2	3	4	
				Unit digit
				Ten's digit

Eg: Type-I

(a) $29 \times 45 = 9 \times 5 = 45$ Unit digit = 5

(b) $18 \times 18 \times 18 + 3$
 $8 \times 8 \times 8 + 3$
 64×8

$32 + 3 = 35 \Rightarrow = 5$

Type = II

(a) (0, 1, 2, 3, 4, 5, 6, 7, 8, 9) (b) (0, 1, 5, 6)

↓
Cyclicity Concept

↓
If there number are at unit place
Unit digit of multiplication is also
a same number.

Eg: (a) 35×35 (b) 36×96
 $1225 \rightarrow \text{same}$ $= 3456 \rightarrow \text{same}$

Helping Hand:

- (a) Divide the Power by 4.
- (b) Remainder of division is 0, 1, 2, 3...
- (c) Remainder $\Rightarrow 1 = n^1$ is unit digit
 Remainder $\Rightarrow 2 = n^2$ is unit digit
 Remainder $\Rightarrow 3 = n^3$ is unit digit
 Remainder $\Rightarrow 0 = n^4$ is unit digit

If n^4 is 2 or 3 digit number, then unit digit of that number, will be the unit digit of Original Exponent.

Solved Examples

① What least number must be added to 1056, so that sum is completely divisible by 23?

Soln \Rightarrow

$$\begin{array}{r}
 23 \overline{) 1056} \quad (45 \\
 \underline{92} \\
 136 \\
 \underline{115} \\
 21
 \end{array}$$

then Number added is = $23 - 21$
 = 2 Ans

② The largest + 4 digit number exactly divisible by 88 is -

- (a) 9944 (b) 9768 (c) 9988 (d) 8888

Soln \Rightarrow Largest 4 digit Number = 9999

$$\begin{array}{r}
 88 \overline{) 9999} \quad (113 \\
 \underline{88} \\
 119 \\
 \underline{88} \\
 319 \\
 \underline{264} \\
 55
 \end{array}$$

$55 \rightarrow$ Sub tract From the 4 digit largest+ number.
 = $9999 - 55 = 9944$ Ans

③ IF the number 517H324 is completely divisible by 3, then the smallest whole no. in place of H will be.

- (a) 0 (b) 1 (c) 2 (d) None

$$\begin{aligned}
 5 + 1 + 7 + H + 3 + 2 + 4 \\
 = 22 + H
 \end{aligned}$$

If number is divisible by 3, then sum of digit is also divisible by 3.

IF 2 is used in place of H, then number is divisible by 3 (i.e-24)

④ Which one of the following no. is divisible by 11?

- (a) 235641 (b) 245642 (c) 315624 (d) 415624

Soln ⇒ (a) 235641

$$(2+5+4) - (3+6+1) = 1 \text{ (not divisible by 11)}$$

(b) 245642

$$(2+5+4) - (4+6+2) = 1 \text{ (not divisible by 11)}$$

(c) 315624

$$(3+5+2) - (1+6+4) = -1 \text{ (not divisible by 11)}$$

(d) 415624

$$(4+5+2) - (1+6+4) = 0 \text{ (divisible by 11)}$$

If a number is divisible by 11, the Difference of Sum of digit at odd places & Sum of digit at even places is either 0 Or divisible by 11.

⑤ Which on the following number is divisible by 24 -

Soln ⇒ (a) 35718 (b) 63810 (c) 63810 (c) 537804 (d) 3125736

	③	⑧
35718	$3+5+7+1+8$	718 X
	$= 24 \checkmark$	

63810	$6+3+8+1+0$	810 X
	$= 18 \checkmark$	

537804	$5+3+7+8+0+4$	804 X
	$= 27 \checkmark$	

3125736	$3+1+2+5+7+3+6$	736 ✓ ✓
	$= 27 \checkmark$	

If a no. is divisible by another number then it must be divisible by it's prime factors.

Unit digit Concept:

⑥ The digit at unit's place of the Product -

$$81 \times 82 \times 83 \dots \times 89 \text{ is}$$

- (a) 0 (b) 2 (c) 6 (d) 8

Soln $\Rightarrow 81 \times 82 \times 83 \times 84 \times 85 \dots \times 89$

$$1 \times 2 \times 3 \times 20 \dots \times 6 \times 7 \times 8 \times 9$$

$$= 0$$

If we multiply a number by 0, the result at unit place is always zero.

⑦ The digit in unit's place of the Product $(2153)^{167}$ is:

- (a) 1 (b) 3 (c) 7 (d) 9

Soln $\Rightarrow 215\underline{3} \rightarrow$ Let base is 3

(b) $\frac{167}{4} \Rightarrow$ Remainder is 3

(c) $3^3 = 27 \rightarrow$ unit digit is 7

⑧ Unit digit in $(264)^{102} + (264)^{103}$ is -

- (a) 0 (b) 4 (c) 6 (d) 8

Soln $\Rightarrow (264)^{102} + (264)^{103}$

$$= \underset{\downarrow}{6} + \underset{\downarrow}{4}$$

$$= 10$$

Unit digit = 0

If Base is 4, then

(a) \Rightarrow Unit digit of even power is always 6

(b) \Rightarrow Unit digit of odd Power is always 4.

because Cyclicity is 2