1. Numbers:

Number is a mathematical object used to count, label & measure.

a. Types of Numbers:

(i). Natural numbers:

Counting numbers $\{1, 2, 3 \ldots\}$ till infinity

Eg: 1, 15, 18, 386 etc.

(ii) Whole Numbers:

Natural numbers including '0'. $\{0, 1, 2, 3 \ldots\}$.

Eg: 0, 7, 13, 274 etc.

! All Natural numbers are whole numbers.

But, All Whole numbers are NOT natural numbers.

(iii) Integers:

Positive & Negative Counting Numbers as well as '0'.

Eg: ....,-5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5 ....

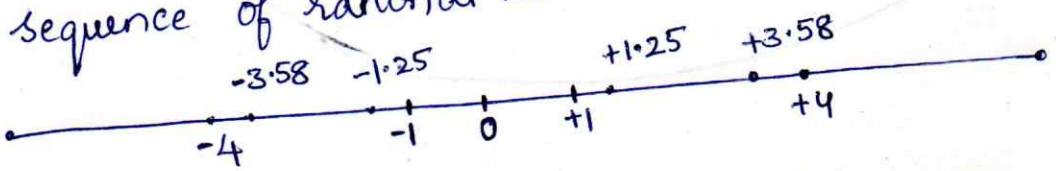
(iv) Rational Numbers:

Numbers that can be expressed as a fraction of an integer & a non-zero integer.

Eg: $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{4}$, $-\frac{1}{2}$, $-\frac{1}{3}$ etc.

(v) Real Numbers:

All Numbers that can be expressed as the limit of a sequence of rational Numbers.



Every real Number corresponds to a point on the Number line.

(VI). Irrational Numbers:

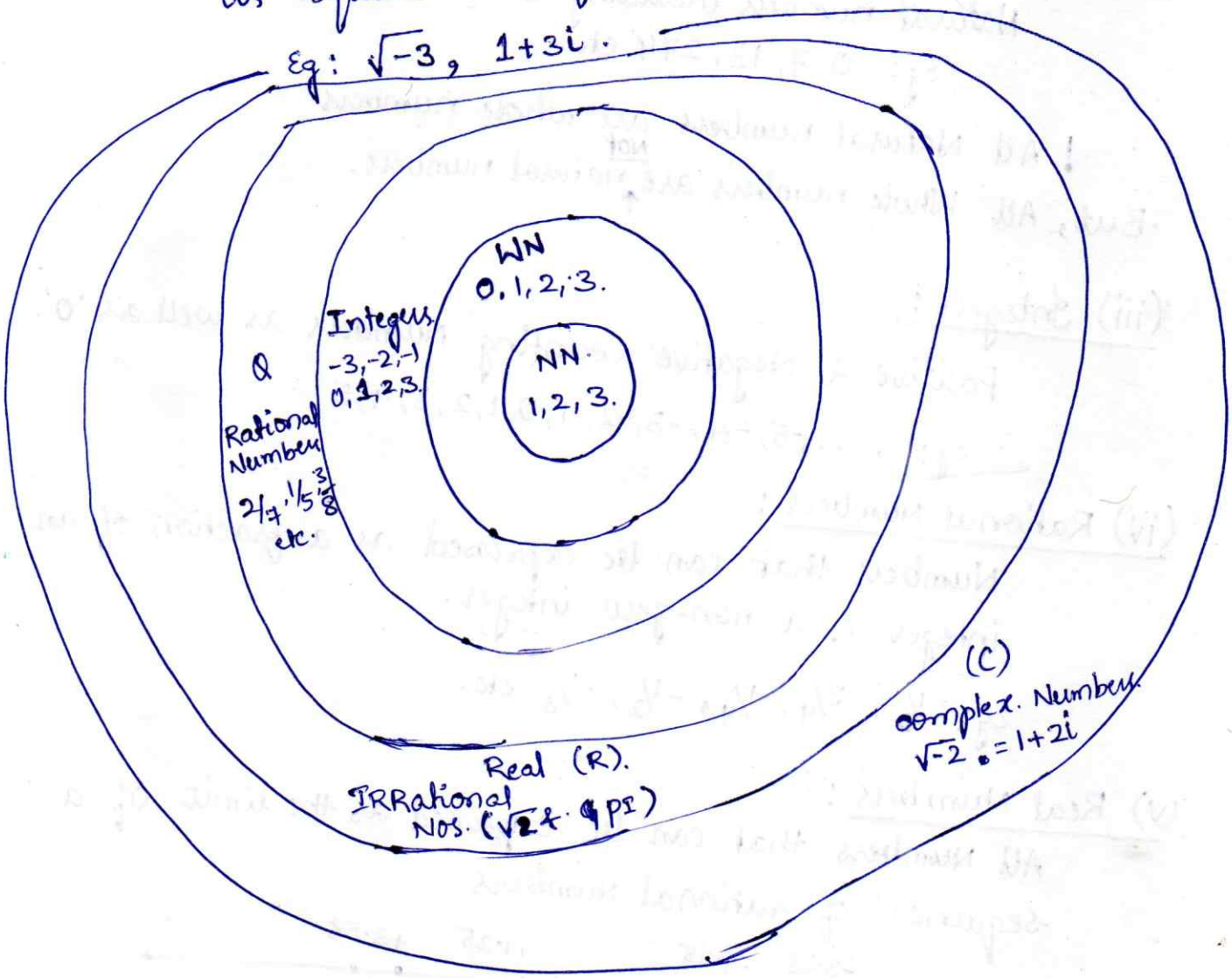
A real no. which is not a rational is called. irrational Number.

Eg: Square root of 2 = 1.41421356.
Golden Ratio (PI) = 1.6180339887 4

(VII) Complex Numbers:

Includes real Numbers & imaginary Numbers, such as square root of -ve number.

Eg: $\sqrt{-3}$, $1+3i$.



b. Prime, Composite, Even & Odd Numbers:

(i) Prime Numbers:

Prime Number is a natural number which are divisible by '1' & 'itself' only.

Eg: 5 is a prime number.
(divisible only '1' & itself).

(ii) Composite Numbers:

Natural Number >1, that is not prime is called Composite Number.

Eg: '6' is a composite number
(∵ can be divisible by '2' & '3', along with '1' & '6').

(iii) Even Numbers:

Any Number (Integer) that can be divisible by '2' (exactly) is called an Even Number.

Eg: 42, -68, 374, -14 etc.

(iv) Odd Numbers:

Any Number (Integer) that cannot be divisible by '2' (exactly) is called an Odd Number.

Eg: 59, 3, 91, 373 etc.

2. Basic Operators:

An operator is a special symbol / phrase that is used to change, check or combine values.

There are '4' basic operators to perform mathematical calculations:

a. Addition
b. Subtraction
c. Multiplication &
d. Division.

a. Addition : (+) - plus sign.

Total Amount of objects together (in a collection)

Eg: $5 + 10 = 15$.

Addends. Sum/Total.

b. Subtraction : (-) - Minus sign.

Removing the objects (from a collection).

Eg: $24 - 17 = 7$

Minuend, Subtrahend, difference.

c. Multiplication : (x) - cross/into

Scaling one number by another

Eg: $8 \times 4 = 32$ → product.

Multiplicand (8 times 4), Multiplier

d. Division : (÷ or − or /) - 'by' or 'divided by'.

* $\frac{\text{dividend}}{\text{divisor}}$

Eg: $14 \div 2$ ($\frac{14}{2}$ or $14/2$) $= 7$.

dividend, divisor, quotient.

3. Sum Root / Digital Root / Digit Sum / add-up.

converting a given Number into a single digit by adding up all the digits in the given Number.

* This method helps to 'check answers' - addition, Subtraction Multiplication, division, Squares, square roots, Cube roots etc.

Eg: (i) Find the digit sum of 2467539.

Ans: $2+4+6+7+5+3+9 = 36$.

$3+6 = 9$.

Hence digit sum = 9.

(ii) Find the digit sum of 56768439

Ans: $5+6+7+6+8+4+3+9 = 48$

$4+8 = 12$

$1+2 = 3$.

Hence digit Sum = 3.

a. Cast of Nines (9):

Any Numbers adding to '9' will result in same Numer

or 'total 9' will be eliminated.

Totalling: 6,3 sums upto 9.
2,7 'these Numbers
1,8 are eliminated while adding up'

Eg: $9+7 = 16$

$1+6 = 7$

Eg: $3+6+8 = 17$

$1+7 = 8$

Eg: (i) Find the digit sum of 12919.

Ans: $1+2+9+1+9 = 4$.

or 12919

$1+2+1 = 4$.

(ii) Find the digit sum of 63727

Ans: $6+3+7+2+7 = 7$.

or $63727 = 7$

b. Answer Verification: (dR, SR, dS, AUP)

(i) Addition:

1. Verify 1827365 + 9988888 + 6300852 + 11111111
= 45674496

digit sum of addends together = digit sum of Sum/Total.

(DS) Sum of Addends: 0 + 4 + 6 + 8 = 9

(SR of Sum/Total): 6+7+4+4+6 = 27 = 9.

2. Verify 978 + 1846 = 2824.

ds(a1) + ds(a2) = ds(s).

(ii) Subtraction:

1. Verify 63 - 21 = 42.

digit sum of Minuend - digit sum of Subtrahend = digit sum of difference

9 - 3 = 6.

2. Verify. 5798 - 3672 = 2126.

* One limitation is that Some cases, Minued (SR) < Subtrahend (SR).
In such cases, Keep Minued at higher Value. (Add '9' to Minuend).

3. Verify 67458 - 43756 = 23702

ds(minuend) - ds(Subtrahend) = ds(difference)

(iii) Multiplication:

1. Verify $467532 \times 107777 = 50389196364$

$9 \times 2 = 9$

$= 18 = 9$

$1+8 = 9$

digit sum of Multiplicand x digit sum of Multiplier = digit sum of product

2. Verify $999816 \times 727235 = 727101188760$.

ds(Multiplicand) x ds(Multiplier) = ds(product)

(iv) Division:

1. Verify whether 2308682040 (dividend) divided by 36524 (divisor) equals 63210. (quotient)

ds of dividend = ds of divisor x ds of quotient + ds of Remainder.

$6 = 2 \times 3 + 0$

$= 6 + 0$

$= 6.$

2. Verify $89/3$

$Q = 29 \quad R = 2.$

ds(dividend) = ds(divisor) x ds(quotient) + ds (Remainder).

Hint : (Important).

"The digit-sum method can only tell us whether the answer is wrong or not. It cannot tell us with complete accuracy whether the answer is correct or not."

* digit sums match - Most likely correct.
* Do not match - Wrong.

(V) Squaring / Square rooting :

$ds(\sqrt{\ }) * ds(\sqrt{\ }) = ds(sq.)$

Eg: 23 is square root of 529.
Verify

✓ digit sum of square root = 2+3 = 5.
So. 5 × 5 = 25 = 7.

✓ digit sum of square = 5+2+9 = 7

(VI) Cubing / Cube rooting :

$ds(\sqrt{\ }) * ds(\sqrt{\ }) * ds(\sqrt{\ }) = ds(cube)$.

Eg: Verify whether 2197 is the cube of 13.

$ds(\sqrt{2}) = 1+3 = 4$

$\Rightarrow 4 \times 4 \times 4 = 64 = 6.1$

$ds(cube) = 2+1+9+7 = 1$.

Restriction Eg:

product of $9993 \times 9997 = 99900021$

$= 3 \times 7 = 2+1$

$21 = 2+1$

$2+1 = 2+1$

$3 = 3$

However;
if we get
99900012.
↓
Here also verification is Right.

Hence Answer verification
- fails 'wrong'.
- tallies 'Most likely correct'

4. Complementary (parama Mitra):

* Two digits are complementary, if their sum is '10'.

Eg: 3 & 7 are complementary.
(∵ 3+7=10).
complementary for 2 is 8 etc.

Complementary to 9

* Two digits are complementary (9), if their sum is '9'.

Eg: 1 is complementary 8.
complementary of 3 is 6 etc.

Exercise:

PART A:

Q. (1). Instantly calculate the digit-sum of the following numbers:

(1) 23456789
(2) 27690815
(3) 7543742
(4) 918273645

PART B:

Q. (1). Verify whether the following answers are correct or incorrect without the actual calculation

(1) $95123 \times 66666 = 6341469918$
(2) $838102050 \div 12345 = 67890$
(3) $88^3 = 681472$
(4) $88^2 = 7444$
(5) $475210 + 936111 + 315270 = 726591$
(6) $9999999 - 6582170 = 3417829$
(7) $6582170 - 9999999 = -3417829$

(8) $\frac{900}{120}$ gives quotient 7 & remainder 60

(9) $0.45632 \times 0.65432 = 0.2985793024$.

PART C :

Q (1). Select the correct answer from the alternatives without doing actual calculation.

(1) $3569 \times 7129 =$ _____

(a) 25443701

(b) 25443421

(c) 25443401

(d) 25445401.

(2) $6524 + 3091 + 8254 + 6324 + 7243 + 5111 + 9902 + 3507 =$ _____

(a) 49952

(b) 49852

(c) 59956

(d) 49956

PART D :

Q 1. Find the complementary 10. for the below numbers.

a. 6 b. 3 c. 9 d. 7 e. 5.

2. Find the complimentary 9. for the below numbers.

a. 3 b. 6 c. 8 d. 2 e. 9.