GENERAL APTITUDE

Trainer : Yogesh Chavan
yogesh.chavan@sunbeaminfo.com

What is **Aptitude ?**

It is your natural ability to learn or excel in a certain area.

For example, you could have an **aptitude** for math and logic.

Key to **success**

1. Problem Recognition
2. Speed
3. Practice

Link for **English Basics**

- https://www.learngrammar.net/practice
- https://www.myenglishpages.com/english/exercises.php
- https://www.englisch-hilfen.de/en/exercises_list/alle_grammar.htm
- https://www.grammarbank.com/
- https://www.really-learn-english.com/english-grammar-exercises.html
- https://www.really-learn-english.com/english-reading-comprehension-text-and-exercises.html
- https://www.thefreshreads.com/unseen-passage-for-class-10/
- https://www.englishgrammar.org/exercises/

- Practice Synonyms and Antonyms regularly.
- Read Idioms and Phrases.
- Book - Word Power Made Easy by Norman Lewis
- Book - English Grammar by Wren and Martin

Basic **MATHS**

- Tables at least from 2-30
- Squares from 2-30
- Cubes from 2-30
- Prime numbers from 1-100
- Divisibility rules for 1-20

- Methods for typical multiplications & divisions
- Methods for finding HCF & LCM
- Methods for finding squares & square roots

Topic Wise Test Plan

TEST NAME	TOPICS
APTI 1	Numbers + LCM + HCF + Ages + Averages
APTI 2	Percentages + Allegations & Mixtures + Profit & Loss
APTI 3	Time & Work + Pipes & Cisterns + Chain Rule
APTI 4	Time & Distance + Trains + Boats + Interest
APTI 5	Clock + Calendar + Probability + Permutation Combination

Numbers

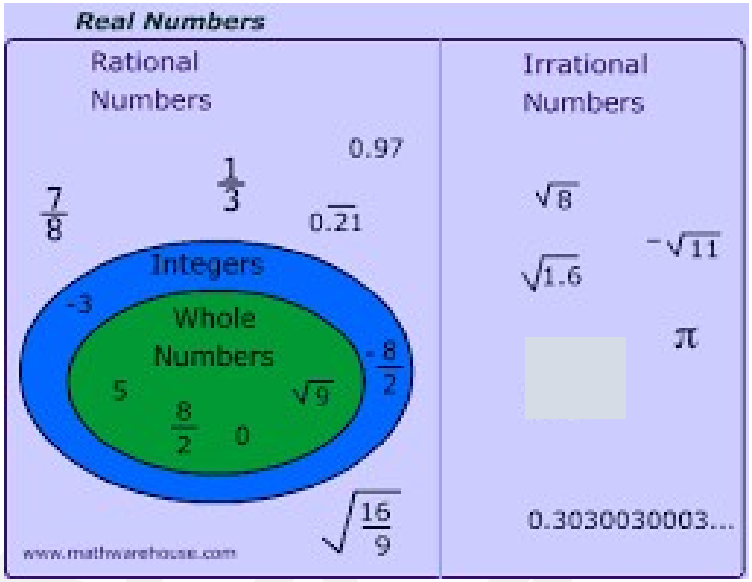
Real

Complex (a+bi)

A complex number is a number that can be expressed in the form a + bi, where a and b are real numbers, and i is a solution of the equation $x^2 = -1$. Because no real number satisfies this equation, i is called an imaginary number

Rational (-2, ¾, 2.25,)

Irrational (√2, 3.14159….)



Integers (∞…,-2,-1,0,1,2….∞)

Whole Nos (0,1,2,3.. ∞)

Negative Nos (∞ ..-2,-1)

Natural Nos (1,2,3… ∞)

Zero (0)

Prime Nos

Composite Nos (3 distinct factors)

Fractions (2/5, 4/3, 3 1/3)

Proper Fractions (2/5, 3/7..)

Improper Fractions (4/3, 8/7..)

Mixed Fractions (3 ⅔, 4 ⅓..)

What is the Difference Between Rational Numbers and Irrational Numbers?

Rational Numbers	Irrational Numbers
Numbers that can be expressed as a ratio of two numbers (p/q form) are termed as a rational number.	Numbers that cannot be expressed as a ratio of two numbers are termed as an irrational number.
Rational Number includes numbers, which are finite or are recurring in nature.	These consist of numbers, which are non-terminating and non-repeating in nature.
If a number is terminating number or repeating decimal, then it is rational. e.g: 1/2 = 0.5	If a number is non-terminating and non-repeating decimal, then it is irrational. e.g: 0.31545673…
Example:- 1/2, 3/4, 11/2, 0.45, 10, etc.	example:-Pi (π) = 3.14159…., Euler's Number (e) = (2.71828…), and √3, √2.

Basic **MATHEMATICAL** operations

- BODMAS
- B - Bracket ( ) , { }, [ ]
- O - Order
- D - Division
- M - Multiplication
- A - Addition
- S - Subtraction.

BASIC FORMULAE

- 1. $(a + b)^2 = a^2 + b^2 + 2ab$
- 2. $(a - b)^2 = a^2 + b^2 - 2ab$
- 3 . $(a + b)^2 - (a - b)^2 = 4ab$
- 4. . $(a + b)^2 + (a - b)^2 = 2(a^2 + b^2)$
- 5. $(a^2 - b^2) = (a + b)(a - b)$
- 6. $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$
- 7. $(a^3 + b^3) = (a + b)(a^2 - ab + b^2)$
- 8. $(a^3 - b^3) = (a - b)(a^2 + ab + b^2)$
- 9. $(a^3 + b^3 + c^3 - 3abc) = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$
- 10. If $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$

ADDITION

- SUM of 2 EVEN numbers is EVEN : 2 + 6=8
- SUM of 2 ODD numbers is EVEN : 7 +17=24
- SUM of ODD & EVEN numbers is ODD : 13 + 8=21

LAST DIGIT is same as last digit of sum of last digits

- E.g. For 431 + 632 + 233 + 539 + 845

  Last digit is the last digit of 1+2+3+9+5 = 20

  So last digit = 0

SUBTRACTION

- DIFF of 2 EVEN numbers is EVEN : 6 – 2 = 4
- DIFF of 2 ODD numbers is EVEN : 17 – 7 = 10
- DIFF of ODD & EVEN numbers is ODD : 13 – 8 = 5

MULTIPLICATION

- PRODUCT of 2 EVEN numbers is EVEN : 6x8=48
- PRODUCT of 2 ODD numbers is ODD : 3x17=51
- PRODUCT of ODD & EVEN numbers is EVEN: 3x6=18

LAST DIGIT is of the product is the same as the last digit of the product of the last digits of the two numbers.

- E.g. For 987**6** x 843**2** = 832773**2**

- No of Digits in the product cannot exceed the sum of the digits of the two numbers.

DIVISION

- DIVISION of ODD number by ODD is ODD : 21 ÷ 3 = 7
- DIVISION of EVEN number by ODD is EVEN: 24 ÷ 3 = 8
- DIVISION of EVEN number by EVEN is ODD/EVEN
  :12 ÷ 4 = 3, 12 ÷ 6 = 2

Sum of Natural Numbers

- **Rule 1 :** Sum of first n natural numbers = $\frac{n(n+1)}{2}$

e.g. sum of 1 to 74 =74 x (74+1)/2 = 2775.

- **Rule 2 :** Sum of first n odd numbers = n^2

e.g. sum of first seven odd numbers

= (1+3+5+7+9+11+13) = 49 = 7^2.

- **Rule 3** : Sum of first n even numbers = n (n+1)

e.g. sum of first 9 even numbers

= (2+4+6+8+10+12+14+16+18) = 90

= 9 (9+1) = 9 x10 = 90

Sum of Natural Numbers

- **Rule 4 :** Sum of squares of first n natural numbers = $\frac{n(n+1)(2n+1)}{6}$

e.g. sum of squares of first 8 natural numbers

= (1 + 4 + 9 + 16 + 25 + 36 + 49 + 64) = 204

= 8 (8+1)(16+1)/ 6 = 8 x 9 x 17 / 6 = 204

- **Rule 5 :** Sum of cubes of first n natural numbers = $[n(n+1)/ 2]^2$

e.g. sum of cubes of first 4 natural numbers

= (1 + 8 + 27 + 64) = 100

= $[4 (4+1)/2]^2$ = 100

DIVISION

- DIVISION by ZERO is NOT POSSIBLE
- If two numbers are divisible by a number then their sum & difference is also divisible by the number.
- E.g. For 63 is divisible by 9. 27 is also divisible by 9.
- So 63 + 27 = 90 is also divisible by 9
- And 63 – 27 = 36 is also divisible by 9

DIVISIBILITY RULES

- 2 : Unit place is even or zero(last digit should be divisible by 2)
- 3 : Sum of the digits is divisible by 3. e.g : 324
- 4 : Last 2 digits are divisible by 4 or last 2 digits are 0. e.g : 324
- 5 : Unit digit is 5 or 0
- **6 : Divisible by co primes 2 & 3.** e.g : 324
- 8 : Number formed by last 3 digits is divisible by 8 or last 3 digits are 0. e.g : 1088
- 9 : Sum of all digits is divisible by 9. e.g : 324
- 10: Units digit is 0.

DIVISIBILITY RULES

- 11 : Difference between sum of digits in odd & even places should either be zero or divisible by 11

e.g: 8283

e.g : 918071

- **12 : Divisible by co primes 3 & 4** e.g : 324
- **14 : Divisible by co primes 2 & 7**
- **15** : **Divisible by co primes 3 & 5**
- **16 :** No formed by last 4 digits divisible by 16/ last 4 digits 0.
- **18 : Divisible by co primes 2 & 9**
- 20 : Units digit 0 & tens digit is even.

DIVISIBILITY RULES

- **7 : The difference between the two alternate groups taking 3 digits at a time should either be zero or multiple of 7.**

  eg- 550500006

  eg- 7370356

- **13 : The difference between the two alternate groups taking 3 digits at a time should either be zero or multiple of 13.**

  eg- 200174

DIVISIBILITY RULES

- **17: A number is divisible by 17 if you multiply the last digit by 5 and subtract that from the rest. If that result is divisible by 17, then your number is divisible by 17.**
- For example, for 986, then : 98 - (6 x 5) = 68.
- Since, 68 is divisible by 17, then 986 is also divisible by 17.
- Also, 876 is not divisible by 17 because 87 - (6 x 5) = 57 and 57 is not divisible by 17.

- **19: To determine if a number is divisible by 19, take the last digit and multiply it by 2. Then add that to the rest of the number. If the result is divisible by 19, then the number is divisible by 19.**
- For example, 475 is divisible by 19 because 47 + (5 x 2) = 57, and 57 is divisible by 19.
- But , 575 is not divisible by 19 because 57 + (5 x 2) = 67, and 67 is not divisible by 19.

PROPERTIES OF DIVISIBILITY

To find a number completely divisible by another :

A) **Greatest 'n' digit number exactly divisible by a Number :**

Method : By subtracting the remainder

e.g a) Greatest 3 digit number divisible by 13

Greatest 3 digit number = 999. 999/13 gives remainder 11.

999-11 = 988 = Greatest 3 digit number divisible by 13

B) **Least 'n' digit number exactly divisible by a Number :**

Method : By adding the (divisor – remainder)

e.g b) Least 3 digit number divisible by 13

Least 3 digit number = 100. 100/13 gives remainder 9

100 + (13 – 9) = 104 = Least 3 digit number divisible by 13

PROPERTIES OF DIVISIBILITY

Q. On dividing a number by 999, the quotient is 366 and the remainder is 103. The number is:

A.364724 B.365387 C.365737 D.366757 E. None of these

Soln-

dividend = divisor x quotient + remainder

Required number = 999 x 366 + 103

= (1000 - 1) x 366 + 103

= 366000 - 366 + 103

= 365737

Ans: C

PROPERTIES OF DIVISIBILITY

Q. A number when divided by 342 gives remainder 47. If the same number is divided by 19 what would be the remainder?

A. 7 B. 8 C. 9 D. 10

Soln :

On dividing the number by 342 let the quotient be q.

→ Number = 342q + 47

→ Number = (19 x 18q) + (19x2 + 9)

→ Number = 19(18q+2) + 9

→ When number is divided by 19 it gives 18q+2 as the quotient & remainder = 9

Ans : C

Sum of Natural Numbers

Q. The difference between the sum of the first 2n natural numbers and the sum of the first n odd natural numbers is

A. n^2 - n

B. n^2 + n

C. $2n^2$ - n

D. $2n^2$ + n

Ans: B

- Sum of first 2n natural numbers is $\frac{2n(2n+1)}{2}$
- Sum of first n odd numbers = n^2

Sum of Natural Numbers

- **Rule 1 :** Sum of first n natural numbers = $\frac{n(n+1)}{2}$

e.g. sum of 1 to 74 =74 x (74+1)/2 = 2775.

- **Rule 2 :** Sum of first n odd numbers = n^2

e.g. sum of first seven odd numbers

= (1+3+5+7+9+11+13) = 49 = 7^2.

PRIME NUMBERS

- A number that is divisible only by itself and 1 (e.g. 2, 3, 5, 7, 11).
- There are 25 prime numbers between 1 - 100
- *1 is neither prime nor composite number.*
- **2 is the only prime number which is even.**
- A number having more than 2 factors is a composite number
- Find prime numbers between 101 and 200??
- There are 21 prime numbers between 101 - 200

Co-Prime

- When two numbers (they may not be prime) do not have any common factor other than one between them they are called co-prime or relatively prime.
- It is obvious that two prime numbers are always co-prime. e.g : 17 and 23
- Two composite numbers can also be co-prime. e.g: 16 & 25 do not have any common factor other than one.
- Similarly 84 and 65 do not have any common factor and hence are co-prime.

Prime Number

Step 1 : Make a judgment of the square root of the number

Step 2 : Try divisibility by all prime numbers upto the sq. root

 # If the number is not divisible by any of the primes below its square root then it is prime.

Prime Number

Q. Find whether 467 is prime or not

Step 1 : Sq root of 467→ Between 21 (441) and 22 (484)

Step 2 : 467 is not divisible by 2, 3, 5, 7, 11, 13, 17, 19. Next prime is 23 which exceeds the square limit.

Therefore 467 is prime.

Prime Number

- Prime numbers 1-100

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Prime Number(Assignment)

Q. Which of the following is a prime number?

A. 303 B. 477 C. 113 D. None of these

Ans : C

Numbers(Assignment)

Q. A number when divided by 5 leaves 3 as remainder. If the square of the same number is divided by 5, the remainder obtained is :

A. 9 B. 4 C. 1 D. 3

Soln:

number when divided by 5 leaves a remainder 3

Let the given number = 5n + 3 ---> using dividend = divisor quotient + remainder

Square of the number = $(5n + 3)^2$

= $25n^2 + 30n + 9$ --> $(a + b)^2 = a^2 + 2ab + b^2$

= $5 \times 5n^2 + 5 \times 6n + 5 + 4$

= $5\,(5n^2 + 6n + 1) + 4$

Required remainder = 4

Ans: B

Prime Number(Assignment)

Q. The prime numbers dividing 143 and leaving a remainder of 3 in each case are

A. 2 and 11

B. 11 and 13

C. 3 and 7

D. 5 and 7

Ans: D

Number System(Assignment)

Q. The mean of first 10 even natural numbers is ?

A. 9

B. 10

C. 11

D. 12

Ans: C

Prime Number(Assignment)

Q. The sum of first four primes is

A. 10

B. 11

C. 16

D. 17

Ans: D

Prime Number(Assignment)

Q. Which of the following is a prime number?

A. 19

B. 20

C. 21

D. 22

Ans: A

Prime Number(Assignment)

Q. Find the mean of first six odd natural numbers?

A. 6

B. 11

C. 7

D. 5

Ans: A

Numbers(Assignment)

Which of the following is the output of 57 x 57 + 43 x 43 + 2 x 57 x 43 ?

A. 10000 B. 5700 C. 4300 D. 1000

Ans : A

Numbers(Assignment)

Q. Which of the following is the output of 6894 x 99 ?

A. 685506 B. 682506 C. 683506 D. 684506

Ans: B

Numbers(Assignment)

Q. What is the unit digit in 584 x 428 x 667 x 213 ?

A. 2 B. 3 C. 4 D. 5

Ans: A

Numbers(Assignment)

Q. The sum of reciprocals of two consecutive numbers is 15/56. The first number is

A. 8 B. 7 C. 6 D. 15.

Ans : B

Divisibility (Assignment)

Q. What percentage of the numbers from1 to 50 have squares ending in the digit 1?

A. 1 B. 10 C. 11 D. 20

Ans : D

Numbers(Assignment)

Q. If $64^2 - 36^2 = 20 \times A$, then A = ?

A. 70 B. 120 C. 180 D. 140 E. None of these

Ans: D

Numbers(Assignment)

Q. On dividing a number by 19 the difference between quotient and remainder is 9. The number is?

A. 370 B. 371 C. 361 D. 352

Ans : B

Numbers(Assignment)

Q. $(112 \times 5^4) = ?$

A. 67000 B. 70000 C. 76500 D. 77200 E. None of these

Ans: B

Numbers(Assignment)

Q. Which of the following is a prime number?

A.143 B. 289 C. 117 D. 359

Ans : D

HCF & LCM

HCF / GCF(Highest/Greatest Common Factor)

- HCF of two or more numbers is the greatest / largest / highest/biggest number which can divide those two or more numbers exactly.

Factors of 6 : 1, 2, 3, 6

Factors of 8 : 1, 2, 4, 8

Common 1 & 2 Highest & Common 2

- **LCM(Least Common Multiple)**
- The LCM of two or more numbers is the smallest / lowest / least number which is exactly divisible by those two or more numbers.

Multiples of 6 : 6, 12, 18, 24, 30, 36, 42, 48, 54,…

Multiples of 8 : 8, 16, 24, 32, 40, 48, 56, 64….

Common 24, 48, …. Lowest & common 24

HCF (Factorization method)

- HCF of 54,72,126 (factorization method)

A. 21 B. 18 C. 36 D. 54

Ans : B

HCF (Factorization method)

- Eg. HCF for 136, 144, 168

2	136	144	168
2	68	72	84
2	34	36	42
	17	18	21

NO FURTHER COMMON FACTOR

So HCF = 2 x 2 x 2 = 8

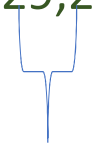
Note : HCF is always <= the smallest of given numbers

HCF (Difference Method)

- Find HCF of 203,319

Keep smaller here

- (203, 319)
- (116,203)
- (87,116)
- (29,87)
- (29,58)
- (29,29)



HCF =29

HCF (Difference Method) - (Assignment)

- HCF of 161,253 (difference method)

A. 27 B. 18 C. 23 D. 17

Ans : C

HCF

Q. Find HCF of 84,125

- (84,125)
- (41,84)
- (41,43)
- (2,41)
- (2,39)

- If nothing is common then HCF =1 and numbers are said to be co prime numbers.

HCF & LCM

Q. Find the greatest number which can divide 284, 698 &1618 leaving the same remainder 8 in each case?

A. 36 B. 46 C. 56 D. 43.

Soln-

Remainder 8 → (numbers – 8) would be exactly divisible.

→284-8 = 276

→698-8 = 690

→1618-8 = 1610

→Greatest number dividing above 3 = HCF(276, 690, 1610) (difference method)

→HCF = 46

Ans: B

HCF & LCM

Q. Find the greatest number which can divide 62, 132 & 237 leaving the same remainder in each case?

A. 35 B. 46 C. 56 D. 43.

Soln:-

If two numbers a & b are divisible by a number n then

→ Their difference (a-b) is also divisible by n.

→132-62 = 70

→237-132 = 105

→237-62 = 175

→Greatest number dividing above 3 = HCF(70, 105, 175)

→HCF = 35

Ans: A

HCF & LCM

Q. Find the largest number such that 43,65,108 are divisible by that number and we get the remainder as 1,2,3 respectively in each case?

A. 21 B. 27 C.42 D. 63

Soln:

→ (numbers – remainder) would be exactly divisible.

→ 43 – 1 = 42

→ 65 – 2 = 63

→ 108 – 3 = 105

HCF(42,63,105)=21

Ans : A

HCF & LCM

Q. A teacher has 25 books, 73 pens & 97 erasers. She wants to distribute them equally to maximum number of students so that after distribution she has equal number of books, pens & erasers left. What is the maximum number of students for such a distribution?

A. 32 B. 21 C. 12 D. 24

Soln:-

If two numbers a & b are divisible by a number n then

→ Their difference (a-b) is also divisible by n.

→73-25 = 48

→97-73 = 24

→97-25 = 72

→Greatest number dividing above 3 = HCF(72, 48, 24)

→HCF = 24

Ans: D

HCF & LCM(Assignment)

Q. Find the greatest number which can divide 62, 132 & 237 leaving the same remainder in each case?

A. 35 B. 46 C. 56 D. 43.

Ans : A

HCF & LCM(Assignment)

Q. Find largest number such that if 45,68 and 113 are divided by that number we get the remainder as 1,2 and 3 respectively.

A. 21 B. 22 C. 26 D. 24

Ans: B

HCF & LCM(Assignment)

Q. Find the greatest number which can divide 41, 131 & 77 leaving the same remainder in each case?

A. 28 B. 18 C. 36 D. 24

Ans : B

LCM

Q. LCM for 12,24,20

A. 210 B. 180 C. 120 D. 144

Ans : C

LCM

- Eg. LCM for 18, 28, 108, 105

2	18	28	108	105
2	9	14	54	105
3	9	7	27	105
3	3	7	9	35
3	1	7	3	35
5	1	7	1	35
7	1	7	1	7
Till all quotients are 1	1	1	1	1

So LCM = 2 x 2 x 3 x 3 x 3 x 5 x 7 = 3780

Note : LCM is always >= the greatest of given nos

LCM(Assignment)

Q. LCM for 12,24,20

A. 210 B. 180 C. 120 D. 144

Ans : C

LCM (Assignment)

Q. Find LCM of 72,125

A. 9000 B. 1200 C. 1000 D. 800

Ans : A

LCM (Assignment)

Find the LCM of 12,18, and 27

A. 900 B. 120 C. 108 D. 820

Ans : C

Rules to Remember

- Product of two given numbers is equal to the product of their HCF & LCM

  A x B = HCF(A,B) x LCM(A,B)

- If a, b, c are three numbers that divide a number n to leave the same remainder r, the smallest value of ‘n’ is

  n = (LCM of a, b, c) + r e.g 3,4,5 & rem 1

LCM

Q. Find LCM of 147 & 231

Soln:-

- As we know,
- **HCF X LCM = product**
- Find HCF by difference method
- Put in the formula,
- 21 x LCM = (147 x 231)
- 1617

LCM

Q. Find LCM of 84 and 125

Soln:-

- As they are co-prime numbers the product is the LCM because HCF =1 (for co-primes)
- HCF x LCM = product
- 1 x LCM = 84 x 125
- LCM = 10500


THANK
YOU!