

### **GENERAL APTITUDE**

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## 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.myenglishpages.com/english/exercises.php
- https://www.grammarbank.com/
- https://www.really-learn-english.com/english-grammar-exercises.html
- <a href="https://www.really-learn-english.com/english-reading-comprehension-text-and-exercises.html">https://www.really-learn-english.com/english-reading-comprehension-text-and-exercises.html</a>
- 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 1-25
- Squares from 1-25
- 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

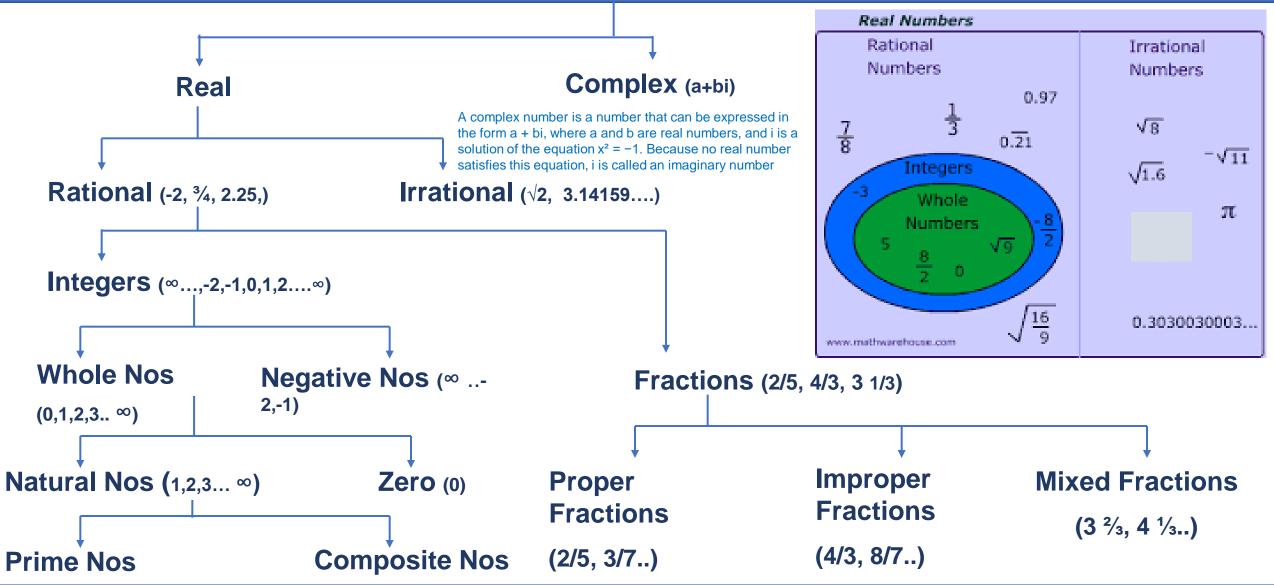


# **Topic Wise** Test Plan

TEST NAME	TOPICS	
APTI 1	Numbers + LCM + HCF + Ages + Averages	
APTI 2	Percentages + Alligations & 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**





#### 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 $(\pi)$ = 3.14159, Euler's Number (e) = (2.71828), and $\sqrt{3}$ , $\sqrt{2}$ .	



## Basic MATHEMATICAL operations

- BODMAS
- B Bracket (), {}, []
- O Order
- D Division
- M Multiplication
- A AdditionS 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  $a^3 + b^3 + c^3 = 3abc$



## **Basic NUMBER Representation**

- Place Value: Units, Tens, Hundreds, ....
- Value of a 2 digit no. 'ab' where both a & b are natural numbers = 10(a) + b
- The number with reversed digits will be 'ba' & the value of the number will be = 10(b) + a



## **Numbers**

Q. A number consists of two digits.

Sum of the digits is 9. If 63 is subtracted from the number its digits are interchanged. Find the number.

A. 72

B. 90

C. 63

D. 81

#### Solution:

Let the tens digit be a & units digit be b a + b = 9 .....(1) 10a + b - 63 = 10b + a9a - 9b = 63 .....(2) (1)x99a + 9b = 81 ....(3) (2) + (3) $18a = 144 \rightarrow a = 8$ , b= 1 Number = 81

Ans: D



## **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<sup>2</sup>
- 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
  - $= 9 (9+1) = 9 \times 10 = 90$



## **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

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

$$= 8 (8+1)(16+1)/6 = 8 \times 9 \times 17/6 = 204$$

• 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

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

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



### **MULTIPLICATION**

1. To multiply by 9, 99, 999....

Place as many zeroes to the right of multiplicand as there are 9s and subtract the multiplicand itself.

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e.g. 26234 x 999 = ?

26234000

- 26234

26207766
```



## **Multiples**

 Multiples of number are obtained by multiplying that number by natural numbers.

e.g. Multiples of 3 are 3, 6, 9, 12, .....

If we want to find no of multiples of 6 less than 255 255 / 6 = 42 (remainder 3) So there are 42 such multiples.



## **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



- 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.



• 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.



• 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



- 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  $87 (6 \times 5) = 57$  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  $47 + (5 \times 2) = 57$ , and 57 is divisible by 19.
- But , 575 is not divisible by 19 because  $57 + (5 \times 2) = 67$ , 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

 $= (1000 - 1) \times 366 + 103$ 

= 366000 - 366 + 103

= 365737

Ans: C



### **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**

#### 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(Assignment)**

Q. Which of the following is a prime number?

A. 303

Ans: C

B. 477

C. 113

D. None of these



Which of the following is the output of  $57 \times 57 + 43 \times 43 + 2 \times 57 \times 43$ ?

A. 10000

B. 5700

C. 4300

D. 1000

Ans: A



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

A. 685506

B. 682506

C. 683506

D. 684506

Ans: B



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

A. 2

B. 3

C. 4

D. 5

Ans: A



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 from 1 to 50 have squares ending in the digit 1?

A. 1 B. 10 C. 11

D. 20

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)**

• Eg. HCF for 136, 144, 168

_2	136	144	<u> 168</u>	
2	68	72	84	
2	34	36	42	
	17	18	21	
•	NO FURTHER COMMON FACTOR			

So HCF = 
$$2 \times 2 \times 2 = 8$$

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

### **HCF (Factorization method) - (Assignment)**

HCF of 54,72,126 (factorization method)

A. 21 B. 18

C. 36

D. 54

Ans: B



# **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 (Difference Method)**

#### 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.



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  $\rightarrow$  (numbers – 8) would be exactly divisible.

**→**284-8 = 276

 $\rightarrow$ 698-8 = 690

 $\rightarrow$ 1618-8 = 1610

 $\rightarrow$  Greatest number dividing above 3 = HCF(276, 690, 1610) (difference method)

 $\rightarrow$ HCF = 46

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.

 $\rightarrow$ 132-62 = 70

 $\rightarrow$  237-132 = 105

 $\rightarrow$  237-62 = 175

 $\rightarrow$  Greatest number dividing above 3 = HCF(70, 105, 175)

 $\rightarrow$ HCF = 35

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.
- $\rightarrow$  43 1 = 42
- $\rightarrow$  65 2 = 63
- $\rightarrow$  108 3 = 105
- HCF(42,63,105)=21

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

 $\rightarrow$  Greatest number dividing above 3 = HCF(72, 48, 24)

 $\rightarrow$ HCF = 24

# **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.



# **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



# **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



• 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 3	35
	7	1	7	1	
Till all quotients are 1		1	1	1	1

So LCM =  $2 \times 2 \times 3 \times 3 \times 3 \times 5 \times 7 = 3780$ 

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



Q. LCM for 12,24,20

A. 210

B. 180

C. 120

D. 144

Ans: C



Q. Find LCM of 72,125

A. 9000

B. 1200

C. 1000

D. 800



### **Rules to Remember**

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

$$A \times B = HCF(A,B) \times LCM(A,B)$$

• 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
```



### Q. Find LCM of 147 & 231

#### Soln:-

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



#### 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



# Q. Find the least number which when divided by 12,15,24 leaves a remainder of 5 in each case

- Soln:
- Find LCM(12,15,24) = ?

- LCM = 120
- In an LCM problem, if remainder is common then,



Q. Find the smallest number which when divided by 20,36,45 leaves a remainder 15,31 and 40 respectively.

- Soln:
- Find LCM(20,36,45)
- In LCM problem, if difference is common(constant) then,
- Result = LCM Common difference

```
20
36
45
40
```

• Result = 
$$180 - 5$$
 =  $175$ 



Q. Four numbers are in the ratio of 10: 12: 15: 18. If their HCF is 3, then find their LCM.

A. 420

B. 540

C. 620

D. 680



Q. Find the least number which when divided by 5,6,7 and 8 leaves a reminder of 3 but when divided by 9 leaves no remainder.

A. 1677

B. 2523

C. 3363

D. 1683

Ans: D



# **HCF & LCM(Think)**

Q. The traffic lights at three different road crossings change after every 48 sec,72 sec,108 sec respectively. If they all changes simultaneously at 08:20:00 hours, then at what time they will change again simultaneously?

A. 08:28:12

B. 08:27:12

C. 08:29:00

D. 08:30:00



Q. Find the least number which when divided by 12,15,40 leaves a remainder of 5 in each case

A. 120

B. 125

C. 130

D. 140



Q. If the product of two numbers is 324 and their HCF is 3, then their LCM will be =?

A. 972

B. 327

C. 321

D. 108

Ans: D



Q. Three number are in the ratio of 3:4:5 and their L.C.M. is 2400. Their H.C.F. is:

A. 40

B. 80

C. 120

D. 200



Q. Find the least number which when divided by 16,18,20 and 25 leaves a reminder of 4 but when divided by 7 leaves no remainder.

A. 17004

B. 18000

C. 18002

D. 18004

Ans: D



### **Rules to Remember**

#### • Fractions:

LCM = LCM of Numerators / HCF of Denominators

**HCF = HCF of Numerators / LCM of Denominators** 

LCM of 25/12 & 35/18

LCM = 175/6

HCF of 25/12 & 35/18

HCF = 5/36



# **HCF & LCM Fractions(Assignment)**

- Find HCF & LCM of 5/9 and 25/36
- Ans : HCF = 5/36 and LCM = 25/9





