

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.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

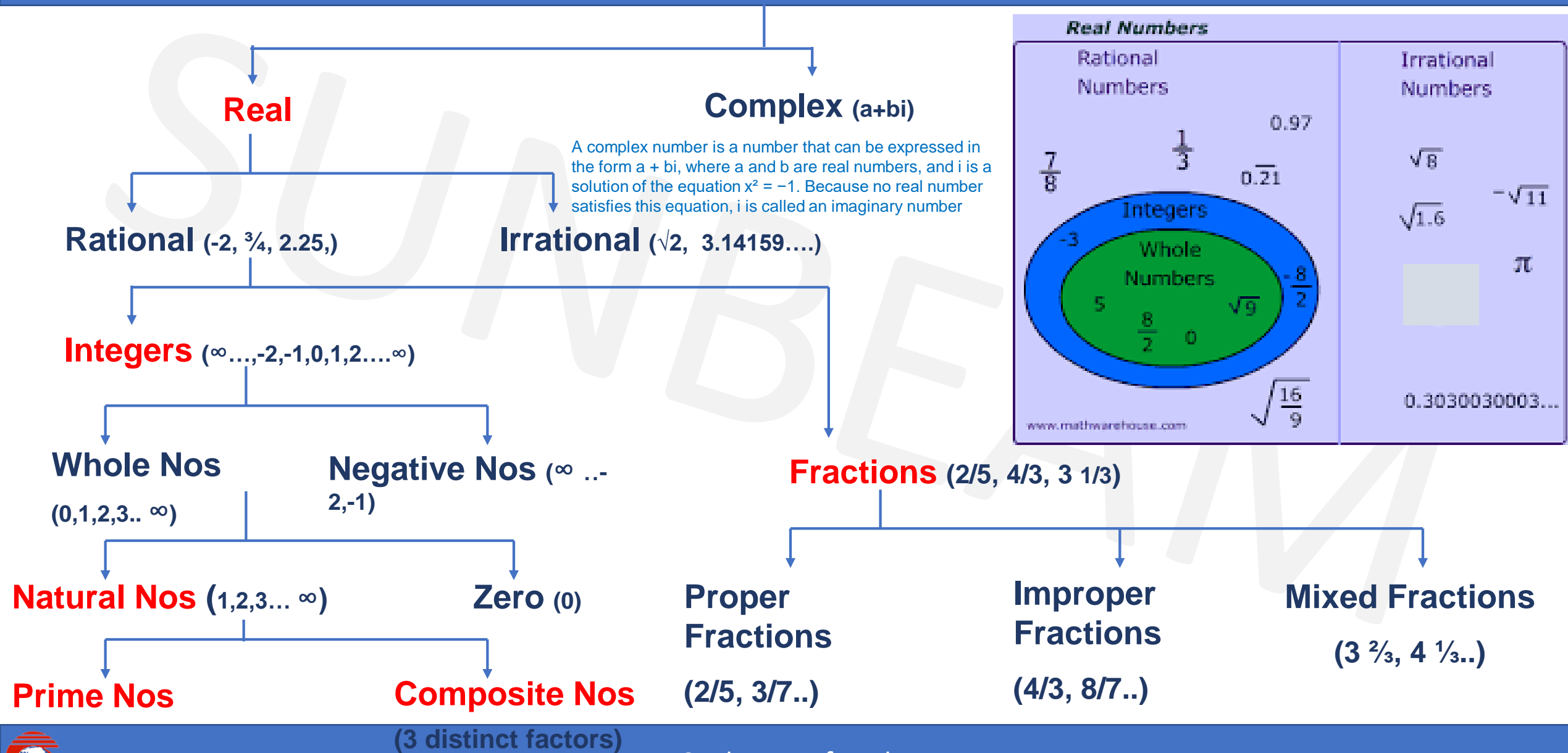


Topic Wise Test Plan

TEST NAME	TOPICS
APT I 1	Numbers + LCM + HCF + Ages + Averages
APT I 2	Percentages + Allegations & Mixtures + Profit & Loss
APT I 3	Time & Work + Pipes & Cisterns + Chain Rule
APT I 4	Time & Distance + Trains + Boats + Interest
APT I 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 (π) = 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 - 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 : $6 \times 8 = 48$
- PRODUCT of 2 ODD numbers is ODD : $3 \times 17 = 51$
- PRODUCT of ODD & EVEN numbers is EVEN: $3 \times 6 = 18$

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 $987\underline{6} \times 843\underline{2} = 832773\underline{2}$
- 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 : $21 \div 3 = 7$
- DIVISION of EVEN number by ODD is EVEN: $24 \div 3 = 8$
- DIVISION of EVEN number by EVEN is ODD/EVEN
: $12 \div 4 = 3$, $12 \div 6 = 2$



Sum of Natural Numbers

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

e.g. sum of 1 to 74 = $74 \times (74+1)/2 = 2775$.

- **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

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

= $9(9+1) = 9 \times 10 = 90$



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

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

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



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 : $98 - (6 \times 5) = 68$.
 - 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

$$\begin{aligned}\text{Required number} &= 999 \times 366 + 103 \\ &= (1000 - 1) \times 366 + 103 \\ &= 366000 - 366 + 103 \\ &= 365737\end{aligned}$$

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 .

$$\rightarrow \text{Number} = 342q + 47$$

$$\rightarrow \text{Number} = (19 \times 18q) + (19 \times 2 + 9)$$

$$\rightarrow \text{Number} = 19(18q+2) + 9$$

\rightarrow 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 = $74 \times (74+1)/2 = 2775$.

- **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



Number System

Number Range	No. of Odd Numbers
1 to 50	25
1 to 100	50
1 to 200	100
1 to 300	150
1 to 500	250
1 to 1000	500
1 to 10000	5000

- An odd number is an integer which is not a multiple of 2
- If these numbers are divided by 2, there will be a remainder left
- In the number line, 1 is the first positive odd number



Number System

- 10 is the smallest two-digit even number.
- There are a total of 50 even numbers from 1 to 100.
- 2 is the only even prime number.
- Numbers that are multiples of 2 are even numbers.
- The sum of even numbers 1 to 100 is 2550.
- The average or mean of all even numbers 1 to 100 is 51.
- **Is zero an odd number? Why?**
- No, zero is not an odd number but an even number, because, when we divide 0 by 2, it gives us a quotient equal to 0 and also there is no remainder left after division. So, 0 is evenly divided by 2.
- $0 \div 2 = 0$
- **$2n$**
- To find the even numbers, we use the formula $2n$, where n is the count of the even number.
- For example, the first even number is $2 \times 1 = 2$, the second even number is $2 \times 2 = 4$, and the last even number from 1 to 100 will be $2 \times 50 = 100$.



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 = $(5n + 3)^2$

$$= 25n^2 + 30n + 9 \rightarrow (a + b)^2 = a^2 + 2ab + b^2$$

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

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

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 $57 \times 57 + 43 \times 43 + 2 \times 57 \times 43$?

A. 10000

B. 5700

C. 4300

D. 1000

Ans : A



Numbers(Assignment)

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

A. 685506

B. 682506

C. 683506

D. 684506

Ans: B



Numbers(Assignment)

Q. What is the unit digit in $584 \times 428 \times 667 \times 213$?

A. 2

B. 3

C. 4

D. 5

Ans: A



Numbers(Assignment)

Q. The sum of reciprocals of two consecutive numbers is $\frac{15}{56}$. 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



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 = $2 \times 2 \times 2 = 8$

Note : HCF is always \leq 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



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

$$\rightarrow 284 - 8 = 276$$

$$\rightarrow 698 - 8 = 690$$

$$\rightarrow 1618 - 8 = 1610$$

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

$$\rightarrow \text{HCF} = 46$$

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.

$$\rightarrow 132 - 62 = 70$$

$$\rightarrow 237 - 132 = 105$$

$$\rightarrow 237 - 62 = 175$$

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

$$\rightarrow \text{HCF} = 35$$

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.

$$\rightarrow 43 - 1 = 42$$

$$\rightarrow 65 - 2 = 63$$

$$\rightarrow 108 - 3 = 105$$

$$\text{HCF}(42, 63, 105) = 21$$

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.

$$\rightarrow 73 - 25 = 48$$

$$\rightarrow 97 - 73 = 24$$

$$\rightarrow 97 - 25 = 72$$

→ Greatest number dividing above 3 = $\text{HCF}(72, 48, 24)$

$$\rightarrow \text{HCF} = 24$$

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

Note : LCM is always \geq 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

$$A \times B = \text{HCF}(A,B) \times \text{LCM}(A,B)$$

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

$$n = (\text{LCM of } a, b, c) + r \quad \text{e.g } 3,4,5 \text{ \& rem } 1$$



Q. Find LCM of 147 & 231

Soln:-

- As we know,
- **HCF X LCM = product**
- Find HCF by difference method
- Put in the formula,
- $21 \times \text{LCM} = (147 \times 231)$
- 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)
- $HCF \times LCM = \text{product}$
- $1 \times LCM = 84 \times 125$
- $LCM = 10500$



