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TCS course

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Number System

Basics of Number System

1) Face Value

It is nothing but the number itself about which it has been asked.

Example: In the number 23576

Face value of 5 is 5 and face value of 7 is 7.

2) Place Value: The place value of a number depends on its position in the number. Each position has a value 10 times the places to its right.

Example: In the number 23576

Place value of 5 is 500 and place value of 3 is 3000.

Types of Numbers

1) Natural Numbers (N) :

All positive counting numbers. (0 is not included in it.)

Examples: 1, 2, 3, 4... etc.

2) Whole Numbers (W): All non-negative numbers are all whole numbers.

Examples: 0, 1, 2, 3, 4... etc.

3) Integer Numbers (I): All negative numbers and positive numbers. Positive numbers are called positive integers and negative numbers are called negative integers.

I = ..., -4, -3, -2, -1, 0, 1, 2, 3, 4, ...

4) Even Numbers

2, 4, 6, 8, 10, ... [Divisible by 2 completely]

5) Odd Numbers: 1, 3, 5, 7, 9, 11, ...

[Not divisible by 2 completely]

Divisibility Test

By 2:- When last digit is 0 or an even number eg: 520, 588

By 3:- Sum of digits is divisible by 3

eg: 1971, 1974

By 4:- When last two digits are divisible by 4 or, they are zeros eg: 1528, 1700

By 5: When last digit is 0 or 5

eg: 1725, 1790

By 6:- When the number is divisible by 2 and 3 both eg: 36, 72

By 8:- When last three digit is divisible by 8 eg: 2256

By 9:- When sum of digit is divisible by 9 eg: 9216

By 10:- When last digit is eg: 452600

By 11:- When sum of odd and even place digits difference is 0 or divisible by 11 eg: 217382

Sum of odd place digits = $2+7+8 = 17$

Sum of even place digits = $1+3+2 = 6$

$17 - 6 = 11$, hence 217382 is divisible by 11.

Important Formulas

1. Sum of first n natural numbers = $\frac{n(n+1)}{2}$

2. Sum of first n odd numbers = n^2

3. Sum of first n even numbers = $n(n+1)$

4. Sum of square of first n natural numbers = $\frac{n(n+1)(2n+1)}{6}$

5. Sum of cubes of first n natural number = $\left[\frac{n(n+1)}{2}\right]^2$

6. $(x^m - a^m)$ is divisible by $(x - a)$ for all values of m.

7. $(x^m - a^m)$ is divisible by $(x + a)$ for even values of m.

8. $(x^m + a^m)$ is divisible by $(x + a)$ for odd values of m.

9. Number of prime factors of a^p, b^q, c^r, d^s is $p+q+r+s$ when a, b, c, d are all prime numbers.

Number of Zeros in an expression

We shall understand this concept with the help of an example.

Let's find the number of zeros in the following expression: $24 \times 32 \times 17 \times 23 \times 19 = (2^3 \times 3^1) \times 2^5 \times 17 \times 23 \times 19$

Notice that a zero is made only when there is a combination of 2 and 5. Since there is no '5' here there will be no zero in the above expression.

Example:

$$8 \times 15 \times 23 \times 17 \times 25 \times 22 =$$

$$2^3 \times (3^1 \times 5^1) \times 23 \times 17 \times 5^2 \times 2^1 \times 11$$

In this expression there are 4 twos and 3 fives. From this 3 pairs of 5×2 can be formed. Therefore, there will be 3 zeros in the final product.

Q. Find the number of zeros in the value of:

$$2^2 \times 5^4 \times 4^6 \times 10^8 \times 6^{10} \times 15^{12} \times 8^{14} \times 20^{16} \times 10^{18} \times 25^{20}$$

Ans.

$$2^2 \times 5^4 \times 4^6 \times 10^8 \times 6^{10} \times 15^{12} \times 8^{14} \times 20^{16} \times 10^{18} \times 25^{20} =$$

$$2^2 \times 5^4 \times 2^{12} \times 2^8 \times 5^8 \times 2^{10} \times 3^{10} \times 3^{12} \times 5^{12} \times 2^{42} \times 2^{32} \times 5^{16} \times 2^{18} \times 5^{18} \times 5^{40}$$

Zeros are possible with a combination of 2×5

Here number of 5's are less so number of zeros will be limited to the number of 5's.

In this expression number of fives are: $5^4 \times 5^8 \times 5^{12} \times 5^{16} \times 5^{18} \times 5^{40}$; i.e. $4+8+12+16+18+40 = 98$

Remainder Theorem

Q. What will be the remainder when 17×23 is divided by 12?

Ans. We can write:

$$17 \times 23 = (12 + 5) \times (12 + 11)$$

$$= 12 \times 12 + 12 \times 11 + 5 \times 12 + 11 \times 5$$

In the above expression we will find that remainder will depend on the last term i.e. 11×5

$$\text{Now, } \text{rem} \left(\frac{11 \times 5}{12} \right) = 7.$$

So, $\frac{12 \times 12 + 12 \times 11 + 5 \times 12 + 11 \times 5}{12}$ and

$\frac{11 \times 5}{12}$ remainder is same in both cases which is 7.

Example: Remainder when $1421 \times 1423 \times 1425$ is divided by 12?

$$\text{rem} \left(\frac{1421 \times 1423 \times 1425}{12} \right) = \text{rem} \left(\frac{5 \times 7 \times 9}{12} \right) = \text{rem} \left(\frac{35 \times 9}{12} \right) = \text{rem} \left(\frac{11 \times 9}{12} \right) = 3$$

Negative Remainder

Taking negative remainder will make our calculation easier.

Examples

$$\text{i) rem} \left(\frac{7 \times 8}{9} \right) = \text{rem} \left(\frac{-2 \times -1}{9} \right) = -2 \times -1 = 2$$

$$\text{ii) rem} \left(\frac{55 \times 56}{57} \right) = \text{rem} \left(\frac{-2 \times -1}{57} \right) = -2 \times -1 = 2$$

$$\text{iii) rem} \left(\frac{7 \times 10}{9} \right) = \text{rem} \left(\frac{-2 \times 1}{9} \right) = -2 \times 1 = -2 \text{ or, } 7$$

Large Power Concepts

Look at the following examples:

$$\text{i) rem} \left(\frac{28^{12345}}{9} \right) = \text{rem} \left(\frac{(27+1)^{12345}}{9} \right)$$

$$= \text{rem} \left(\frac{1^{12345}}{9} \right) = 1^{12345} = 1$$

$$\text{ii) rem} \left(\frac{26^{12345}}{9} \right) = \text{rem} \left(\frac{(27-1)^{12345}}{9} \right)$$

$$= \text{rem} \left(\frac{-1^{12345}}{9} \right) = -1^{12345} = -1 \text{ or, } 8$$

Application of Remainder Theorem

Find the last two digits of the expression $22 \times 31 \times 44 \times 27 \times 37 \times 43$

If we divide the above expression by 100, we will get the last two digits as remainder.

$$\Rightarrow \text{rem} \left(\frac{22 \times 31 \times 44 \times 27 \times 37 \times 43}{100} \right),$$

dividing by 4 to make it simple

$$= \text{rem} \left(\frac{22 \times 31 \times 11 \times 27 \times 37 \times 43}{25} \right) = \text{rem} \left(\frac{132 \times 22 \times 216}{25} \right) = \text{rem} \left(\frac{7 \times 22 \times 16}{25} \right)$$

$$= \text{rem} \left(\frac{4 \times 16}{25} \right) = \text{rem} \left(\frac{14}{25} \right) = 14$$

$$= \text{rem} \left(\frac{4 \times 16}{25} \right) = \text{rem} \left(\frac{14}{25} \right) = 14$$

Since we had divided by 4 initially now to get the correct answer, we need to multiply the remainder by 4.

So remainder will be

$14 \times 4 = 56$, which will also be the last two digits of the expression.

Variety Questions

Q.1 The sum of 3-digit numbers abc, cab and bca is not divisible by:

SSC CGL 24/8/2021 (Morning)

- (a) $a + b + c$ (b) 37 (c) 31 (d) 3

Q.2 The six-digit number $537xy5$ is divisible by 125. How many such six-digit numbers are there?

SSC CHSL 19/4/2021 (Morning)

- (a) 4 (b) 2 (c) 3 (d) 5

Q.3 When a number M is divided by 7, the remainder is 6. What is the remainder if the square of M is divided by 7?

SSC CHSL 19/4/2021 (Evening)

- (a) 4 (b) 1 (c) 3 (d) 2

Q.4 How many numbers between 400 and 700 are divisible by 5, 6 and 7?

SSC CPO 2020 24-11-2020 (Evening Shift)

- (a) 2 (b) 5 (c) 10 (d) 20

Q.5 Find the sum of $6+8+10+12+14+\dots+40$.

SSC CGL Tier-II (18-11-2020)

- (a) 400 (b) 424 (c) 1600 (d) 414

Q.6 Find the number of prime factors in the product $(30)^5 \times (24)^5$.

SSC CGL Tier-II (18-11-2020)

- (a) 45 (b) 35 (c) 10 (d) 30

Q.7 Given that $2^{20}+1$ is completely divisible by a whole number. Which of the following is completely divisible by the same number?

SSC CHSL 16-10-2020 (Afternoon)

- (a) $2^{15}+1$ (b) 5×2^{30}
(c) $2^{90}+1$ (d) $2^{60}+1$

Q.8 Which of the following numbers will completely divide $7^{81}+7^{82}+7^{83}$?

SSC CHSL 17-03-2020 (Morning)

- (a) 399 (b) 389 (c) 387 (d) 397

Q.9 The value of $1 + 3 + 5 + 7 + \dots + (2n - 1)$ is:

SSC CHSL 18-03-2020 (Evening)

- (a) $(2n - 1) \times (2n - 1)$ (b) $\frac{n}{2}$
(c) $n \times n$ (d) $\frac{n(n + 1)}{2}$

Q.10 When 200 is divided by a positive integer x, the remainder is 8. How many values of x are there?

SSC CGL 3 March 2020 (Afternoon)

- (a) 7 (b) 5 (c) 8 (d) 6

Q.11. When a positive integer is divided by d, the remainder is 15. When ten

times of the same number is divided by d, the remainder is 6. The least possible value of d is:

SSC CGL 5 March 2020 (Afternoon)

- (a) 9 (b) 12 (c) 16 (d) 18

Q.12. If the six digit number $479xyz$ is exactly divisible by 7, 11 and 13, then $\{(y+z) \div x\}$ is equal to:

SSC CPO 2019 9-12-19 (Morning)

- (a) $\frac{11}{9}$ (b) 4 (c) $\frac{13}{7}$ (d) $\frac{7}{13}$

Q.13. Which among the following is the smallest?

SSC CPO 2019 9-12-19 (Morning)

- (a) $\sqrt{401} - \sqrt{399}$ (b) $\sqrt{101} - \sqrt{99}$
(c) $\sqrt{301} - \sqrt{299}$ (d) $\sqrt{201} - \sqrt{199}$

Q.14 Let x be the least 4-digit number which when divided by 2, 3, 4, 5, 6 and 7 leaves a remainder of 1 in each case. If x lies between 2800 and 3000, then what is the sum of digits of x?

SSC CPO 2019 9-12-19 (Evening)

- (a) 15 (b) 16 (c) 12 (d) 13

Q.15. If r the remainder when each of 4749, 5601 and 7092 is divided by the greatest possible number $d (> 1)$, then the value of $(d + r)$ will be:

SSC CPO 2019 11-12-19 (Morning)

- (a) 276 (b) 271 (c) 298 (d) 282

Q.16. How many natural numbers less than 1000 are divisible by 5 or 7 but NOT by 35?

SSC CPO 2019 11-12-19 (Morning)

- (a) 285 (b) 313 (c) 341 (d) 243

Q.17. How many natural numbers up to 2001 are divisible by 3 or 4 but NOT by 5?

SSC CPO 2019 13/12/2019 (Morning)

- (a) 768 (b) 801 (c) 934 (d) 1067

Q.18. The number 1563241234351 is:

SSC CPO 2019 13/12/2019 (Evening)

- (a) divisible by both 3 and 11
(b) divisible by 11 but not by 3
(c) neither divisible by 3 nor by 11
(d) divisible by 3 but not by 11

Q.19. When 12, 16, 18, 20 and 25 divide the least number x, the remainder in each case is 4 but x is divisible by 7. What is the digit at the thousands' place in x?

SSC CGL Tier II- 11 September 2019
(a) 5 (b) 8 (c) 4 (d) 3

Q20. One of the factors of $(8^{2k} + 5^{2k})$, where k is an odd number, is :
SSC CGL Tier II- 11 September 2019
(a) 86 (b) 88 (c) 84 (d) 89

Q21. Let $x = (633)^{24} - (277)^{38} + (266)^{54}$ what is the unit digit of x ?
SSC CGL Tier II- 11 September 2019
(a) 7 (b) 6 (c) 4 (d) 8

Q22. The sum of the digits of a two-digit number is $\frac{1}{7}$ of the number. The units digit is 4 less than the tens digit. If the number obtained on reversing its digit is divided by 7, the remainder will be :
SSC CGL Tier II- 11 September 2019
(a) 4 (b) 5 (c) 1 (d) 6

Q23. The number of factors of 3600 is :
SSC CGL Tier II- 12 September 2019
(a) 45 (b) 44 (c) 43 (d) 42

Q24. Let x be the least number which when divided by 15, 18, 20 and 27, the remainder in each case is 10 and x is a multiple of 31. What least number should be added to x to make it a perfect square ?
SSC CGL Tier II- 12 September 2019
(a) 39 (b) 37 (c) 43 (d) 36

Q25. When a two-digit number is multiplied by the sum of its digits, the product is 424. When the number obtained by interchanging its digits is multiplied by the sum of the digits, the result is 280. The sum of the digits of the given number is :
SSC CGL Tier II- 12 September 2019
(a) 6 (b) 9 (c) 8 (d) 7

Q26. If x is the remainder when 3^{61284} is divided by 5 and y is the remainder when 4^{96} is divided by 6, then what is the value of $(2x-y)$?
SSC CGL Tier II- 13 September 2019
(a) -4 (b) 4 (c) -2 (d) 2

Q27. In finding the HCF of two numbers by division method, the last divisor is 17 and the quotients are 1, 11 and 2,

respectively. What is the sum of the two numbers ?

SSC CGL Tier II- 13 September 2019
(a) 833 (b) 867 (c) 816 (d) 901

Q28. Two positive numbers differ by 2001. When the larger number is divided by the smaller number, the quotient is 9 and the remainder is 41. The sum of the digits of the larger number is :
SSC CGL Tier II- 13 September 2019
(a) 15 (b) 11 (c) 10 (d) 14

Q 29. The square root of which of the following is a rational number?
SSC CPO 12 March 2019 (Morning)
(a) 1250.49 (b) 6250.49
(c) 1354.24 (d) 5768.28

Q 30. What is the sum of digits of the least number, which when divided by 15, 18 and 42 leaves the same remainder 8 in each case and is also divisible by 13?
SSC CPO 13 March 2019 (Evening)
(a) 25 (b) 24 (c) 22 (d) 26

Q31. Let x be the greatest number which when divides 6475, 4984 and 4132, the remainder in each case is the same. What is the sum of digits of x?
SSC MTS 22 August 2019 (Morning)
(a) 4 (b) 7 (c) 5 (d) 6

Q32. When 6892, 7105 and 7531 are divided by the greatest number x, then the remainder in each case is y. What is the value of $(x-y)$?
SSC MTS 22 August 2019 (Afternoon)
(a) 123 (b) 137 (c) 147 (d) 113

Q33. The number 45789 is divisible by which of the single digit number:
SSC CPO 16 March 2019 (Morning)
(a) Only by 3 (b) Only by 9
(c) Only by 3 and 7 (d) Only by 3 and 9

Q34. If the seven digit number $56x34y4$ is divisible by 72, then what is the least value of $(x + y)$?
SSC CPO 13 March 2019 (Morning)
(a) 8 (b) 12 (c) 5 (d) 14

Q35. If a 10-digit number $897359y7x2$ is divisible by 72, then what is the value of $(3x - y)$, for the possible greatest value of y?
SSC CGL 7 June 2019 (Afternoon)

(a) 3 (b) 8 (c) 7 (d) 5

Q36. If the six digit number $15x1y2$ is divisible by 44, then $(x + y)$ is equal to :
SSC CGL 10 June 2019 (Afternoon)
(a) 8 (b) 7 (c) 6 (d) 9

Q37. What is the value of x so that the seven digit number $8439x53$ is divisible by 99?
SSC CGL 13 June 2019 (Afternoon)
(a) 9 (b) 4 (c) 3 (d) 6

Q 38. On dividing a number by 38, the quotient is 24 and the remainder is 13, then the number is:
SSC CPO 16 March 2019 (Morning)
(a) 925 (b) 975 (c) 904 (d) 956

Q39. What is the sum of the digits of the least number, which when divided by 12, 16 and 54, leaves the same remainder 7 in each case and is also completely divisible by 13?
SSC CPO 12 March 2019 (Evening)
(a) 36 (b) 16 (c) 9 (d) 27

Q40. When the integer n is divided by 7, the remainder is 3. What is the remainder if $5n$ is divided by 7?
SSC CPO 16 March 2019 (Evening)
(a)3 (b)0 (c)1 (d)2

Q41. The number 23474 is exactly divisible by:
SSC CPO 14 March 2019 (Morning)
(a)2 and 3 only (b)2 and 4 only
(c)2 and 11 only (d)2 only

Q42. The least number that should be added to 10000 so that it is exactly divisible by 327 is:
SSC CPO 15 March 2019 (Morning)
(a) 327 (b) 237 (c) 137 (d) 190

Q43. Which least number should be added to 1000 so that the number obtained is exactly divisible by 37?
SSC CPO 16 March 2019 (Afternoon)
(a)1 (b)25 (c)36 (d)13

Q44. In number 16008, The numeral 6 has a face value:
SSC CPO 15 March 2019 (Evening)
(a)6000 (b)6 (c)60 (d)600

Q45. What is the difference between the largest and smallest numbers of the four digits created using numbers 2, 9, 6, 5? | (Each number can be used only once)
SSC CPO 14 March 2019 (Evening)
(a) 6993 (b) 7056 (c) 6606 (d) 7083

Q46. A gardener planted 1936 saplings in a garden such that there were as many rows of saplings as the columns. The number of rows planted is:
SSC CPO 16 March 2019 (Afternoon)
(a) 46 (b) 44 (c) 48 (d) 42

Q47. The sum of all possible three digit numbers formed by digits 3, 0 and 7, using each digit only once is:
SSC CPO 14 March 2019 (Morning)
(a) 2010 (b) 1990 (c) 2220 (d) 2110

Q48. The ten digit number $2x600000y8$ is exactly divisible by 24. If $x \neq 0$ and $y \neq 0$, then the least value of $(x + y)$ is
SSC CHSL 11 July 2019 (Morning)
(a) 5 (b) 8 (c) 9 (d) 2

Q49. When an integer n is divided by 8, the remainder is 3. What will be the remainder if $6n-1$ is divided by 8?
SSC CGL 13 June 2019 (Evening)
(a) 4 (b) 1 (c) 0 (d) 2

Q50. If a nine-digit number $985x3678y$ is divisible by 72, then the value of $(4x - 3y)$ is :
SSC CGL 4 June 2019 (Morning)
(a) 5 (b) 4 (c) 6 (d) 3

Q51. If a 11 digit number $5y5884805x6$ is divisible by 72, where $x = y$, then the value of \sqrt{xy} is
SSC CGL 10 June 2019 (Morning)
(a) $\sqrt{7}$ (b) 3 (c) 7 (d) $2\sqrt{7}$

Q52. If a 10 digit number $2094x843y2$ is divisible by 88, then the value of $(5x - 7y)$ for the largest possible value of x , is:
SSC CGL 6 June 2019 (Evening)
(a) 3 (b) 5 (c) 2 (d) 6

Q53. What is the least value of x such that $517x324$ is divisible by 12?
SSC CGL 11 June 2019 (Morning)
(a) 3 (b) 1 (c) 0 (d) 2

Practice Questions

SSC CGL Tier I 2021

Q.54 If the 5-digit number $676xy$ is divisible by 3, 7 and 11, then what is the value of $(3x - 5y)$?
SSC CGL 13/8/2021 (Morning)
(a) 10 (b) 7 (c) 9 (d) 11

Q.55 If a five digit number $247xy$ is divisible by 3, 7 and 11, then what is the value of $(2y - 8x)$?
SSC CGL 13/8/2021 (Afternoon)
(a) 6 (b) 17 (c) 9 (d) 11

Q.56. Find the greatest value of b so that $30a68b$ ($a > b$) is divisible by 11.
SSC CGL 13/8/2021 (Evening)
(a) 4 (b) 9 (c) 3 (d) 6

Q57. If the 6-digit number $5x423y$ is divisible by 88, then what is the value of $(5x-8y)$?
SSC CGL 16/8/2021 (Morning)
(a) 28 (b) 14 (c) 16 (d) 24

Q.58 If the nine-digit number $7p5964q28$ is completely divisible by 88, what is the value of $(p^2 - q)$, for the largest value of q , where p and q are natural numbers?
SSC CGL 16/8/2021 (Afternoon)
(a) 72 (b) 9 (c) 0 (d) 81

Q59. Find the difference between squares of the greatest value and the smallest value of P if the number $5306P2$ is divisible by 3.
SSC CGL 16/8/2021 (Evening)
(a) 60 (b) 68 (c) 36 (d) 6

Q60. If the seven-digit number $94x29y6$ is divisible by 72, then what is the value of $(2x+3y)$ for $x \neq y$?
SSC CGL 17/8/2021 (Morning)
(a) 35 (b) 21 (c) 37 (d) 23

Q61. Find the smallest value of a so that $42a48b$ ($a > b$) is divisible by 11.
SSC CGL 17/8/2021 (Afternoon)
(a) 4 (b) 5 (c) 0 (d) 9

Q62. Find the sum of squares of the greatest value and smallest value of K in the number so that the number $45082k$ is divisible by 3.
SSC CGL 17/8/2021 (Evening)

(a) 68 (b) 64 (c) 100 (d) 50

Q63. If the 8-digit number $888x53y4$ is divisible by 72, then what is the value of $(7x + 2y)$, for the maximum value of y ?
SSC CGL 18-08-2021 (Morning)
(a) 19 (b) 15 (c) 23 (d) 27

Q.64. If the 5-digit number $688xy$ is divisible by 3, 7 and 11, then what is the value of $(5x + 3y)$?
SSC CGL 18-08-2021 (Afternoon)
(a) 43 (b) 23 (c) 36 (d) 39

Q65. If a number P is divisible by 2 and another number Q is divisible by 3, then which of the following is true?
SSC CGL 18-08-2021 (Evening)
(a) $P \times Q$ is divisible by 6
(b) $P + Q$ is divisible by 6
(c) $P + Q$ is divisible by 5
(d) $P \times Q$ is divisible by 5

Q66. What is the value of K such that number $72k460k$ is divisible by 6?
SSC CGL 20/8/2021 (Morning)
(a) 4 (b) 9 (c) 7 (d) 8

Q67. The average of squares of five consecutive odd natural numbers is 233. What is the average of the largest number and the smallest number?
SSC CGL 20/8/2021 (Morning)
(a) 11 (b) 17 (c) 13 (d) 15

Q68. What is the sum of the digits of the largest five digit number which is divisible by 5, 35, 39 and 65?
SSC CGL 20/8/2021 (Afternoon)
(a) 33 (b) 30 (c) 35 (d) 27

Q69. The number $823p2q$ is exactly divisible by 7, 11 and 13. What is the value of $(p-q)$?
SSC CGL 20/8/2021 (Evening)
(a) 8 (b) 3 (c) 5 (d) 11

Q.70 If the 5-digit number $593ab$ is divisible by 3, 7 and 11, then what is value of $(a^2 - b^2 + ab)$?
SSC CGL 23/8/2021 (Morning)
(a) 35 (b) 31 (c) 25 (d) 29

Q.71 If the six-digit number $5z3x4y$ is divisible by 7, 11 and 13, then what is the value of $(x + y - z)$?
SSC CGL 23/8/2021 (Afternoon)