SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A++' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

23GET275 – VQAR I

II YEAR/ III SEMESTER

UNIT 1 – QUANTITATIVE ABILITY I

TOPIC 1 – NUMBER THEORY

NUMBER THEORY

Number theory is one of the elementary branches of mathematics that deals with the study of numbers (natural numbers) and properties of numbers, classification of numbers based on certain arithmetic operations.

Divisibility Rule of 2

If a number is even or a number whose last digit is an even number i.e. 2,4,6,8 including 0, it is always completely divisible by 2.

Divisibility Rules for 3

Divisibility rule for 3 states that a number is completely divisible by 3 if the sum of its digits is divisible by 3.

Consider a number, 308. To check whether 308 is divisible by 3 or not, take sum of the digits (i.e. 3+0+8= 11). Now check whether the sum is divisible by 3 or not. If the sum is a multiple of 3, then the original number is also divisible by 3. Here, since 11 is not divisible by 3, 308 is also not divisible by 3.

Divisibility Rule of 4

If the last two digits of a number are divisible by 4, then that number is a multiple of 4 and is divisible by 4 completely.

Example: Take the number 2308. Consider the last two digits i.e. 08. As 08 is divisible by 4, the original number 2308 is also divisible by 4.

Divisibility Rule of 5

Numbers, which last with digits, 0 or 5 are always divisible by 5.

Example: 10, 10000, 10000005, 595, 396524850, etc.

Divisibility Rule of 6

Numbers which are divisible by both 2 and 3 are divisible by 6. That is, if the last digit of the given number is even and the sum of its digits is a multiple of 3, then the given number is also a multiple of 6.

Example: 630, the number is divisible by 2 as the last digit is 0. The sum of digits is 6+3+0 = 9, which is also divisible by 3. Hence, 630 is divisible by 6.

If the remainder is zero or a multiple of 7, then the number is divisible by 7.

Is 5219 divisible by 7?

We separate the last digit, double it, and subtract:

521 – 18 = 503

We repeat the same procedure:

50 – 6 = 44

44 isn't a multiple of 7, therefore 5219 is not divisible by 7.

Example: Is 1073 divisible by 7?

From the rule stated remove 3 from the number and double it, which becomes 6.

Remaining number becomes 107, so 107-6 = 101.

Repeating the process one more time, we have 1 x 2 = 2.

Remaining number 10 – 2 = 8.

As 8 is not divisible by 7, hence the number 1073 is not divisible by 7.

Divisibility Rule of 8

If the last three digits of a number are divisible by 8, then the number is completely divisible by 8.

Example: Take number 24344. Consider the last two digits i.e. 344. As 344 is divisible by 8, the original number 24344 is also divisible by 8.

Divisibility Rule of 9

The rule for divisibility by 9 is similar to divisibility rule for 3. That is, if the sum of digits of the number is divisible by 9, then the number itself is divisible by 9.

Example: Consider 78532, as the sum of its digits (7+8+5+3+2) is 25, which is not divisible by 9, hence 78532 is not divisible by 9.

Divisibility Rule of 10

Divisibility rule for 10 states that any number whose last digit is 0, is divisible by 10.

Example: 10, 20, 30, 1000, 5000, 60000, etc.

Divisibility Rules for 11

If the difference of the sum of alternative digits of a number is divisible by 11, then that number is divisible by 11 completely.

i.e., Sum of digits in odd places – Sum of digits in even places = 0 or a multiple of 11

Basic formulas

1. $(a+b)(a-b) = (a^2 - b^2)$

2. $(a+b)^2 = (a^2 + b^2 + 2ab)$

3. $(a-b)^2 = (a^2 + b^2 - 2ab)$

4. $(a+b+c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

5. $(a^3 + b^3) = (a+b)(a^2 - ab + b^2)$

6. $(a^3 - b^3) = (a-b)(a^2 + ab + b^2)$

7. $(a^3 + b^3 + c^3 - 3abc) = (a+b+c)(a^2 + b^2 + c^2 - ab - bc - ac)$

8. When $a+b+c=0$, then $a^3 + b^3 + c^3 = 3abc$.

Prime number

Why is 1 not considered to be prime?

Solution:

From the definition of prime numbers, we can say that a number is considered to be prime if it contains two distinct factors, namely, 1 and the number itself. The number 1 is divided by 1 itself. Thus, it cannot have any other factor. Hence, 1 is not considered to be prime.

2.Find the LCM of 8, 27 and 72 using the prime factorization method.

Solution:

Prime factorization of 8 = 2 × 2 × 2

Prime factorization of 27 = 3 × 3 × 3

Prime factorization of 72 = 2 × 2 × 2 × 3 × 3

LCM(8, 27, 72) = 2 × 2 × 2 × 3 × 3 × 3 = 216

Therefore, the LCM of 8, 27 and 72 is 216.

NUMBER SYSTEMS

What is the value of $(61^2 – 39^2) \div (51^2 – 49^2)$?

Solution:

$(61^2 – 39^2) \div (512 – 492)$

Consider $(61^2 – 39^2)$

Using the identity $a^2 – b^2 = (a + b)(a – b)$

$(61^2 – 39^2) = (61 + 39) (61 – 39)$

$= 100 \times 22$

$(51^2 – 49^2) = (51 + 49) (51 – 49)$

$= 100 \times 2$

Therefore, $(61^2 – 39^2) \div (51^2 – 49^2) = (100 \times 22)/ (100 \times 2) = 11$

THANK YOU