



## A Brief Study of Cryptography in Context of Number Theory

• Shruti Dubey • Sagun Bharti

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Corresponding Author : Alka Kumari

**Abstract:** *The art of hiding secret messages for years has given rise to the concept of cryptography. With the help of the simplest but intimidating concept of natural numbers and their properties, we can protect important information from our enemies. Once a person said “A little bit of math can accomplish what all the guns and barbed wire can’t: a little bit of math can keep a secret”. It has decided wars and nowadays it is the heart of the communication network.*

**Keywords:** *Number Theory, Euclidean’s algorithm, Cryptography, encryption, decryption, Secret-Key cryptosystem, RSA cryptosystem.*

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### Shruti Dubey

B.Sc. III year, Mathematics (Hons.) Session: 2018-2021,  
Patna Women’s College, Patna University, Patna,  
Bihar, India

### Sagun Bharti

B.Sc. III year, Mathematics (Hons.) Session: 2018-2021,  
Patna Women’s College, Patna University, Patna,  
Bihar, India

### Alka Kumari

Head, Department of Mathematics  
Patna Women’s College, Bailey Road,  
Patna - 800001, Bihar, India  
Email id: [alka.math@patnawomenscollege.in](mailto:alka.math@patnawomenscollege.in)

### Introduction:

Cryptography is the practice and study of techniques for securing communication and data in the presence of adversaries. It is one of the interesting and old concepts in the field of mathematics. It has been used for thousands of years to provide secret communication between mutually trusted parties.

The word cryptography is made up of the ancient Greek word *kryptós* “hidden, secret” and *graphein*, “to write, study”. As time passed the method of cryptography changed and became more advance and secure but the base remains the same. First, we will discuss the basic notions related to encryption.

Number Theory is the branch of mathematics concerned with properties of the positive integers  $\{1, 2, 3, \dots\}$ ; it is one of the oldest and most natural parts of mathematics. Carl Friedrich Gauss quoted beautifully, “Mathematics is the queen of the sciences and number theory is the queen of mathematics”.

There are many applications of number theory like in computer science, numerical analysis and one of the most important is cryptography, there is many more application of number theory in a different field. The more we study number theory the more interesting it becomes.

**Secret key cryptosystem:** The cryptographic system in which the same key is used to encrypt and decrypt the message is called the Secret key cryptosystem. The key