



TITLE: -

**PRIME NUMBER CHECKER AND GENERATOR:
A PYTHON IMPLEMENTATION**

CREATED BY: -

Name: - Uday Gangwar

Branch: - B-Tech (CSEAI)

Course: - Introduction to AI

Institute: - KIET Groups of Institute

University Roll. No.: - 202401100300268

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I worked on this problem statement under the guidance of our AI
Teacher **Mr. Abhisekh Shukla.**

INTRODUCTION

In our mathematics, Natural Number are divided into two categories first Prime Number and second Composite Number. In our Problem we will work on Prime number.

A Prime number is the natural number which is greater than and its divisors are 1 and itself. Prime numbers are fundamental in number theory and have various applications in computer science, cryptography, and other fields. In this report, we will discuss the creation of a Python program that performs two key tasks: checking if a given number is prime and generating a list of all prime numbers up to a specified limit.

The objective of this project is to:

1. Develop a Python program that checks whether a given number is prime and printing Prime numbers in the range of user's provided .
2. Provide clear and structured code with detailed comments to enhance the understanding and explanation of the algorithm.

Importance of Prime Numbers:

Prime numbers play a crucial role in cryptography algorithms, especially in public-key cryptography. They are also essential for algorithms related to hashing, random number generation, and more.

METHODOLOGY

The methodology involves two main steps: Implementing a function to check if a number is prime and another to generate all prime numbers up to a given limit.

1. Prime Number Checker:

The first part of the program involves checking whether a given number is prime. The approach to checking for a prime number follows these steps:

- If the number is less than or equal to 1, it is not a prime number.
- Check if the number is divisible in the range 2 to sqrt of number.
- If no divisor is found in this range, the number is prime.

2. Prime Number Generator:

The second part of the program generates a list of all prime numbers up to a provided limit by user. This is achieved by iterating through numbers from 2 to the limit, using the prime-checking function to determine if each number is prime.

Algorithm:

1. Accept input from the user either to check if a number is prime or to generate primes up to a limit.
2. For checking primality, use a loop to check divisibility.
3. For generating primes, iterate through all numbers up to the limit and collect primes in an empty list.
4. Display the result.

CODE FOR PROBLEM

```
# Function to check if a number is prime

def is_prime(n):

    # If the number is less than or equal to 1, it's not a prime number

    if n <= 1:

        return False

    # Check for divisibility from 2 to the square root of n

    for i in range(2, int(n ** 0.5) + 1):

        # If n is divisible by any number in this range, it's not prime

        if n % i == 0:

            return False

    # If no divisors were found, n is a prime number

    return True


# Function to generate a list of prime numbers up to a given limit

def generate_primes(limit):

    primes = [] # List to store the prime numbers

    # Iterate through numbers from 2 to the given limit

    for num in range(2, limit + 1):

        # If the current number is prime, add it to the list

        if is_prime(num):

            primes.append(num)

    # Return the list of prime numbers

    return primes


# Main program to interact with the user
```

```
print("Prime Number Checker and Generator")
```

```
# Ask the user what they want to do
```

```
choice = input("Do you want to (1) check if a number is prime or (2) generate primes up to a limit?  
Enter 1 or 2: ")
```

```
# If the user chose to check if a number is prime
```

```
if choice == "1":
```

```
    # Ask the user to input a number
```

```
    num = int(input("Enter a number to check if it's prime: "))
```

```
    # Use the is_prime function to check if the number is prime
```

```
    if is_prime(num):
```

```
        print(f"{num} is a prime number.")
```

```
    else:
```

```
        print(f"{num} is not a prime number.")
```

```
# If the user chose to generate prime numbers up to a limit
```

```
elif choice == "2":
```

```
    # Ask the user to input the limit
```

```
    limit = int(input("Enter a limit to generate prime numbers: "))
```

```
    # Use the generate_primes function to get all primes up to the limit
```

```
    primes = generate_primes(limit)
```

```
    # Print the list of primes
```

```
    print(f"Prime numbers up to {limit}: {primes}")
```

```
# If the user entered an invalid option
```

```
else:
```

```
    print("Invalid choice.")
```

RESULT OF OUR CODE

For Checking Number is Prime or not

Prime Number Checker and Generator

Do you want to (1) check if a number is prime or (2) generate primes up to a limit? Enter 1 or 2: 1

Enter a number to check if it's prime: 2

2 is a prime number.

Prime Number Checker and Generator

Do you want to (1) check if a number is prime or (2) generate primes up to a limit? Enter 1 or 2: 1

Enter a number to check if it's prime: 2

2 is a prime number.

For Generating Prime numbers in the required range

Prime Number Checker and Generator

Do you want to (1) check if a number is prime or (2) generate primes up to a limit? Enter 1 or 2: 2

Enter a limit to generate prime numbers: 45

Prime numbers up to 45: [2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43]

Prime Number Checker and Generator

Do you want to (1) check if a number is prime or (2) generate primes up to a limit? Enter 1 or 2: 2

Enter a limit to generate prime numbers: 45

Prime numbers up to 45: [2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43]

REFERENCES

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