



Sieve of Eratosthenes

Sieve of Eratosthenes is a method for finding all primes up to (and possibly including) a given natural. This method works well when is relatively small, allowing us to determine whether any natural number less than or equal to is prime or composite.

Implementation:

Given a number n, print all primes smaller than or equal to n. It is also given that n is a small number. For instance here if n is 10, the output should be "2, 3, 5, 7". If n is 20, the output should be "2, 3, 5, 7, 11, 13, 17, 19".

Python

```

# Python program to print all Primes Smaller
# than or equal to N using Sieve of Eratosthenes

def SieveOfEratosthenes(num):
    prime = [True for i in range(num+1)]
    # boolean array
    p = 2
    while (p * p <= num):

        # If prime[p] is not
        # changed, then it is a prime
        if (prime[p] == True):

            # Updating all multiples of p
            for i in range(p * p, num+1, p):
                prime[i] = False

            p += 1

    # Print all prime numbers
    for p in range(2, num+1):
        if prime[p]:
            print(p)
    
```

Driver code



Dash



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<< Prev

Next >>

```
if __name__ == '__main__':  
    num = 50  
    print("Following are the prime numbers smaller"),  
    print("than or equal to", num)  
    SieveOfEratosthenes(num)
```

Output:

Following are the prime numbers below 30
2 3 5 7 11 13 17 19 23 29

Time Complexity: $O(n \cdot \log(\log(n)))$

Auxiliary Space: $O(n)$

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