Problem 10. The sum of the primes below 10 is $2 + 3 + 5 + 7 = 17$. Find the sum of all the primes below two million.

Knowledge required Sieve of Eratosthenes

Solution Outline: This problem is a classic implementation of **Sieve of Eratosthenes** which can be used to find primes until a limit n in $O(n \times \log n)$ time complexity. We start by implementing the Sieve of Eratosthenes algorithm, which is named as sieve_of_eratosthenes in code listed below, it returns a Boolean list which means whenever i^{th} element in it is True it is a prime, else not. After getting this Boolean array, we simply iterate over the boolean list and sum all of the primes and print it.

Python Solution

```python
def sieve_of_eratosthenes(limit):
    prime_flag = [True] * limit
    prime_flag[0] = prime_flag[1] = False

    i = 2
    while i * i <= limit:
        if prime_flag[i]:
            for j in range(2*i, limit, i):
                prime_flag[j] = False
        i += 1

    return prime_flag

primes = sieve_of_eratosthenes(int(2e6))
primes_sum = sum(i for i, el in enumerate(primes) if el)
print(primes_sum)
```