San José State University
Department of Computer Engineering

CMPE 180-92
Data Structures and Algorithms in C++

Fall 2016
Instructor: Ron Mak

Assignment #3B

Assigned: Friday, September 9
Due: Friday, September 16 at 11:59 PM
URL: http://codecheck.it/codecheck/files/1609110126g9n4etm2rsd41ix6lv16hptv
Canvas: Assignment 3.b. Goldbach's Conjecture
Points: 100

Goldbach's conjecture

This assignment will give you practice with arrays.

Goldbach's conjecture states that every even number 4 or greater is the sum of at least one pair of prime numbers. For example, 10 = 3 + 7 and 5 + 5 (the primes of a pair can be the same). No one has been able to prove that this conjecture is true for all even numbers, and no one has been able to find a counterexample. See https://en.wikipedia.org/wiki/Goldbach%27s_conjecture

Write a C++ program to test Goldbach's conjecture for the even numbers 4 through 100.

Sieve of Eratosthenes

First, you need to find all the prime numbers under 100. Use the Sieve of Eratosthenes to compute an **array for the prime numbers**. You must use an array for this assignment. See https://en.wikipedia.org/wiki/Sieve_of_Eratosthenes

After you compute the prime sieve, print it as a 10 x 10 table of numbers. At each position of the table, print the number if it's prime, else print a dot.

Test the conjecture

Now that you have an array that tells whether or not a given number is prime, you can test Goldbach's conjecture for the even numbers from 4 through 100. For each even number, print all the pairs of primes that add to the number. Don't repeat a pair in reverse. For example, for even number 8, print the prime pair 3 and 5 but don't print 5 and 3.

Expected output

CodeCheck will match your program's output against the following master output. It will ignore blanks within a line (i.e., spacing won't matter) but you must include any blank lines and punctuation characters such as the colon.

```
Primes:

  .  2  3  .  5  .  7  .  .  .
 11  . 13  .  .  . 17  . 19  .
  .  . 23  .  .  .  .  . 29  .
 31  .  .  .  .  . 37  .  .  .
 41  . 43  .  .  . 47  .  .  .
  .  . 53  .  .  .  .  . 59  .
 61  .  .  .  .  . 67  .  .  .
 71  . 73  .  .  .  .  . 79  .
  .  . 83  .  .  .  .  . 89  .
  .  .  .  .  .  . 97  .  .  .

Test of Goldbach's Conjecture:

  4:  2  2

  6:  3  3

  8:  3  5

 10:  3  7
      5  5

    ...

100:  3 97
     11 89
     17 83
     29 71
     41 59
     47 53
```

Rubrics

Criteria	Maximum points
Good output (as determined by CodeCheck) • Correct output values. • Correct output formatting.	**30** • Values: 20 • Formatting: 10
Good program design • Good use of array(s). • Good use of functions. • Good choice of names.	**50** • Array(s): 20 • Functions: 20 • Names: 10
Good program style • Follow the formatting (indentation, position of braces, etc.) and naming conventions of the Savitch textbook.	**20**

You can submit as many times as necessary to get satisfactory results, and the number of submissions will not affect your score. When you're done with your program, click the "Download" link at the very bottom of the Report screen to download a signed zip file of your solution.

Submit the signed zip file into **Canvas: Assignment 3.b. Goldbach's Conjecture**.