

CS19002 PDS Lab, Test 2, Apr 06, 2010

(For students with odd PC numbers)

Goldbach's conjecture states that any even integer $n \geq 6$ can be written as the sum of two (odd) primes. For example, 34 has exactly four such decompositions: $34 = 3 + 31 = 5 + 29 = 11 + 23 = 17 + 17$. Here, $3 + 31$ is not treated different from $31 + 3$.

- (a) Write a C program to find an integer n less than or equal to a bound B such that n has the maximum number of decompositions into sums of two primes (among all positive candidates $\leq B$). (15)
- (b) Report the output of your program for $B = 10^4$. (5)
- (c) Report the output of your program for $B = 10^5$. (5)
- (d) Report the output of your program for $B = 10^6$. (5)

Submit a single printer file. C file will be accepted only if your program does not work.

Note: In order to make your program run in feasible time, particularly for large values of B , add pairs of primes (instead of decomposing n). It is useful to first generate a list of all primes $\leq B$. A simple-minded code will be too slow for $B = 10^6$. If you desire to obtain all outputs, you need to program carefully.

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(For students with even PC numbers)

A prime p is called *truncatable* if all (non-zero) right shifts of the decimal representation of p are again prime. For example, the prime $p = 233993$ is truncatable. All its right-shifted versions are p itself, 23399, 2339, 233, 23 and 2. All of these six integers are prime.

- (a) Write a C program to locate the largest truncatable prime less than or equal to a bound B . (15)
- (b) Report the output of your program for $B = 10^4$. (5)
- (c) Report the output of your program for $B = 10^6$. (5)
- (d) Report the output of your program for $B = 10^9$. (5)

Submit a single printer file. C file will be accepted only if your program does not work.

Note: In order to make your program run in feasible time, particularly for large values of B , append digits to primes (instead of starting with p and dividing by 10 repeatedly). A simple-minded code will be too slow for $B = 10^9$. If you desire to obtain all outputs, you need to program carefully.