

## Problem Set 4

### *Multi-Precision Computing*

#### Problem I

Write a program to test if a number is prime.

#### Problem II

Find the mean distribution of prime numbers between two bounds.

#### Problem III

Generate a random number and check for its primality. How many trials are needed before finding a prime number?

#### Problem IV

How long does it take to find a probable prime number?

#### Problem V

A Mersenne<sup>1</sup> number is a number that is one less than a power of two

$$M_n = 2^n - 1$$

1. Prove that  $M_n$  is prime implies  $n$  is prime.
2. Is it true that  $n$  is prime implies  $M_n$  is prime?
3. Write a program to test if  $M_n$  is prime for  $n$  in between 2 and 1000.

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<sup>1</sup>Marin Mersenne was a 16th century a French monk, philosopher, mathematician and music theorist who is best known for his work in number theory.



Marin Mersenne (1588 - 1648)