Discrete Structures
CS 241 - 001
Department of Physical and Computer Sciences
Medgar Evers College

Project 2: Final Project Proposals

Directions: Choose one (1) of the two (2) final project proposals and submit your choice on blackboard. Once approved, read the instructions carefully and complete all the tasks of the assignment.

Goldbach's Conjecture

The strong Goldbach's conjecture states every even integer greater than or equal to 4 can be written as a sum of two primes. Write a program that shows that Goldbach's conjecture is true for the even integers between 4 and 2000 inclusively. Store the sums in a file with each sum on its own line.
Hint: First find and store all prime numbers less than 2000

Hill Cipher

The Hill cipher is a type of block cipher that uses a $n \times n$ matrix as a key; that is,

$$E(\mathbf{P}) = \mathbf{KP} \bmod m$$

where $\mathbf{K}$ is an $n \times n$ matrix, $\mathbf{P}$ is a $n \times 1$ matrix and m is the size of the plaintext. The key of the Hill cipher, however, must be invertible in order to decrypt the encoded message. Write a program that opens a file and encrypt it using the Hill cipher. The first line of the file will be the encryption key and the remainder of the file is the actual message. Your program must first verify that the key is valid. If it is valid, create an encrypted file of the remainder of the original file, and then, display the decryption key on the screen; otherwise, create a copy of the original file excluding the first line. **Note: The plaintext is the alphabet (A through Z). And the key will be a 2×2 matrix listed by row.**

Subsets

Write a program that stores all the subsets of a set consisting of at most six (6) elements. The program should prompt the user to enter the elements of the set which should be letters or digits; and then, it should create a file that lists all the subsets of the set. Each subset should be on its own line and written in set notation.

Word Scramble

Write a program that stores all words that can be generated from a string of letters that contains at most twelve (12) characters. The program should prompt the user to enter a string of letters; and then, it should create a file that lists all words of length 3 to the length of the string in alphabetical order with each word on its own line.
Note: A file named "wordlist.txt" contains a list of words.