

CS335 Exercise Set 1

Due Thursday, September 6

Instructions: Write solutions to the following problems. Submit your code via the submission webpage linked to the class web page. Be sure to submit just one file (either zip or tar).

1. Exercise 6.24 pg. 294 (Perfect number)

An integer number is said to be a *perfect number* if its factors, including 1 (but not the number itself) sum to the number. For example, 6 is a perfect number, because $6 = 1 + 2 + 3$. Write a method `perfect` that determines whether parameter `number` is a perfect number. Use this method in an application that determines and displays all the perfect numbers between 1 and 1000. Display the factors of each perfect number to confirm that the number is indeed perfect. Challenge the computing power of your computer by testing numbers much larger than 1000. Display the results.

2. Exercise 7.27 pg. 359 (Sieve of Eratosthenes)

A prime number is any integer greater than 1 that is evenly divisible only by itself and 1. The Sieve of Eratosthenes is a method of finding prime numbers. It operates as follows:

- a) Create a primitive type Boolean array with all elements initialized to `true`. Array elements with prime indices will remain `true`. All other array elements will eventually be set to `false`.
- b) Starting with array index 2, determine whether a given element is `true`. If so, look through the remainder of the array and set to `false` every element whose index is a multiple of the index for the element with the value `true`. Then continue the process with the next element with value `true`. For array index 2, all elements beyond element 2 in the array that have indices which are multiples of 2 (indices 4, 6, 8, 10, etc.) will be set to `false`; for array index 3, all elements beyond element 3 in the array that have indices which are multiples of 3 (indices 6, 9, 12, 15, etc.) will be set to `false`; and so on

When this process completes, the array elements that are still `true` indicate that the index is a prime number. These indices can be displayed. Write an application that uses an array of 1000 elements to determine and display the prime numbers between 2 and 999. Ignore array elements 0 and 1.