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C++ Project 1 Report

AMS 595

Question 1

This program has you input an integer n, and using if, else if, and else statements, it outputs "Negative One" if n = -1, "Positive One" if n = 1, "Zero" if n = 0, and "Other Value" if n = any other value.

Question 2

This program takes a vector of integers as input and prints the integer elements of the vector as output. This function uses a for loop to iterate through the vector, and using vector indexing, it outputs each of the vector's elements as it iterates.

Question 3

This program uses a while loop to generate the elements of the Fibonacci sequence that do not exceed 4,000,000, starting at 1. While the sum of the previous two terms is less than 4,000,000, that sum becomes the next term in the Fibonacci sequence and is printed as output. The while loop iterates until the newest term exceeds 4,000,000.

Question 4

Part A)

This function takes an integer n as input and determines whether n is prime or not using if, else statements, and a nested for loop within the else statement. If n = 0 or n = 1, the function returns "False" because 0 and 1 are not prime numbers. For n greater than one, an integer i is generated from the range 2 to (n/2), and the for loop iterates through these values of i. If n is divisible by i, then n is not prime, and the function returns "False". Otherwise, the integer n is prime, and the function returns "True".

Part B)

This function takes an integer n as input, and returns a vector whose elements are the factors of n. This program determines all of the factors of n using a for loop. The function generates an integer i from the range 1 to n, and the for loop iterates through these values of i. If n is divisible by i, then i is a factor of n, and therefore i is appended to the vector of factors of n.

<u>Part C)</u>

This function takes an integer n as input, and returns a vector whose elements are the prime factors of n. This program finds the prime factorization of n using a while loop and if, else statements. Starting at i = 2, while i*i <= n, if n % i, then i is not a prime factor. If n = floor(n /= i), then i is a prime factor of n, and i is appended to the vector of prime factors. After the while loop terminates, if n > 1, append n to the vector of prime factors.

<u>Question 5</u>

This program uses iteration (for loop and nested for loops) to generate the first n rows of Pascal's triangle. Input an integer n to represent the desired number of rows, and for i in the range 1 through n, start the row with 1 always, and for j in the range 1 through (n – i), loop to generate the spaces in the rows. Then for k in the range 0 through i, loop to append the values within the rows, and update the current value being used within each iteration of the loop. The program then outputs the first n rows of Pascal's triangle as desired.