1806ICT Programming Fundamentals

Functions

1. Write a program to find the sum of the series 1!/1+2!/2+3!/3+4!/4+5!/5 using functions.

2. The least common multiple (lcm) of two positive integers u and v is the smallest positive integer that is evenly divisible by both u and v. Thus, the lcm of 15 and 10, written as lcm(15, 10), is 30 because 30 is the smallest integer divisible by both 15 and 10. Write a function lcm() that takes two integer arguments, and returns their lcm.

    Hint: Create a function lcm which takes 2 integer parameters a and b and returns the least common multiple of these 2 integers. In the function lcm have C code that does the following:

    -   Let m equal the smallest of a and b
    -   Loop with i starting at m and increasing up to a * b. Stop when a and b both evenly divide i as i will be the least common multiple of a and b.

    Sample Run:

Input	Output
15 10	30
48 24	48

3. An integer is said to be a prime number if it is divisible by 1 and itself. For example, 2, 3, 5, and 7 are prime numbers, but 4, 6, 8, and 9 are not. Write a function that determines if a number is prime.

    Hint: Create a function prime which takes 1 integer parameter. In the function prime have C code that does the following:

    -   Loop, with i starting at 2 and going to a / 2 and check if i evenly divides a. If it does then a is not prime.

4. A Fibonacci series is a series of numbers: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, … where the next number is found by adding up the two numbers before it. Write a function that will find the nth integer in the Fibonacci series.

    Sample Run:

Input	Output
0	0
1	1
2	1
3	2
4	3
5	5
6	8

5. The Goldbach conjecture says that every even integer n that is greater than 2 has the property that it is the sum of two prime numbers. Using your solution from Q3, write a program that will prove that the conjecture is true for all even integers between two numbers that you will input into the program.

    Sample Run:

Input	Output
4 10	4 = 2 + 2
	6 = 3 + 3
	8 = 3 + 5
	10 = 3 + 7

40 50	40 = 3 + 37 42 = 5 + 37 44 = 3 + 41 46 = 3 + 43 48 = 5 + 43 50 = 3 + 47

6. Write a function that separately sums the even indexed elements and odd indexed elements of an array of doubles. Each element of the array contributes to one of the two sums, depending on whether the index of the element is even or odd. Your function definition should look something like this:

```
void sum(double a[],
         int n,                              /* n is the size of a[] */
         double *even_index_sum_ptr,
         double *odd_index_sum_ptr)
{
    …
}
```

Write a program to test your function. You can assume that the program reads in the size of the array, followed by the array elements. In this question, the array elements are all floating point values.

Sample Run:

Input	Output
4 1.1 4.2 8.3 9.4	Sum of even indexed numbers = 9.4 Sum of odd indexed numbers = 13.6

7. Write a program that uses functions to generate all permutations of the numbers 0, 1, 2, 3, 4, 5.