Assignment 8: Recursive function

You should read the following topics before starting this exercise

1. Recursive definition
2. Declaring and defining a function
3. How to call a function
4. How to pass parameters to a function

Recursion is a process by which a function calls itself either directly or indirectly. The points to be remembered while writing recursive functions

i. Each time the function is called recursively it must be closer to the solution.
ii. There must be some terminating condition, which will stop recursion.
iii. Usually the function contains an if –else branching statement where one branch makes recursive call while other branch has non-recursive terminating condition

Expressions having recursive definitions can be easily converted into recursive functions

Sr. No	Recursive definition	Recursive Function	Sample program

1.	The recursive definition for factorial is given below:
	
	n!= 1 if n = 0 or1
	= n * (n-1)! if n >1
		long int factorial (int n)
		{
		If(n==0)||(n==1))
		/* terminating condition */
		return(1);
		else
		return(n* factorial(n-1));
		/* recursive call */
		}
			#include <stdio.h>
			main()
			{
			int num;
			/* function declaration */
			long int factorial(int n);
			printf("\n enter the number:");
			scanf("%d",&num);
			printf("\n The factorial of %d is %ld",num,factorial(num));
			}
			/* function code*/

2.	The recursive definition for nCr (no of combinations of r objects out of n objects) is as follows
	nCn =1
	nC0 =1
	nCr = n-1Cr + nCr-1
		long int nCr(int n, int r)
		{ if(n==r || r==0)
		/* terminating condition */
		return(1);
		else
		return (nCr(n-1,r) + nCr(n, r-1));
		/* recursive call */
		}
			#include <stdio.h>
			/* function code*/
			main()
			{
			int n, r;
			printf("\n enter the total number of objects:");
			scanf("%d",&n);
			printf("\n enter the number of objects to be selected");
			scanf("%d",&r);
			printf("\n The value %dC%d is %ld",n, r, nCr(n,r));
			}

Set A . Write C programs for the following problems

1. Write a recursive C function to calculate the sum of digits of a number. Use this function in main to accept a number and print sum of its digits.
2. Write a recursive C function to calculate the GCD of two numbers. Use this

function in main. The GCD is calculated as:

gcd(a,b)=a if b = 0
= gcd (b, a mod b) otherwise

3. Write a recursive function to find factorial of a given number.
4. Write a recursiveCfunctiontocalculatex^y.(Donotusestandardlibraryfunction)

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Set B. Write C programs for the following problems

1. Write a recursive function to calculate Fibonacci number. Use this function in main to display the first n Fibonacci numbers. The recursive definition of nth Fibonacci number is as follows:

   fib(n)=1 if n = 1 or2
   = fib(n-2)+fib(n-1) if n>2

2. Write a recursive function to calculate the sum of digits of a number till you get a single digit number. Example: 961 -> 16 -> 5. (Note: Do not use a loop)

3. Write a recursive C function to print the digits of a number in reverse order. Use this function in main to accept a number and print the digits in reverse order separated by tab.

   Example: 3456 Output: 6 5 4 3

   (Hint: Recursive print(n) = print n if n is single digit number
   = print n % 10 + tab + Recursive print (n/10)

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Assignment Evaluation

0:Not Done [ ] 2:LateComplete [ ] 4:Complete [ ]

1:Incomplete [ ] 3:Need Improvement [ ] 5: Well Done [ ]

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