Shri G.S. Institute of Technology & Science
Department of Computer Engineering
CO34563: Design and Analysis of Algorithms
Assignment # 01: warm-up assignment

Submission Date: 23th Feb 2023@23:59
Late Submission: Not allowed
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Q. 1.	Write a C program to take Input 5 integers through keyboard, and display the second largest number.
Q. 2.	Write a C program to take Input a 4-digit integer through keyboard, and display the sum and product of all its digits.
Q. 3.	Write a C program to take Input an integer through keyboard, and print whether it is an odd number or even number.
Q. 4.	Write a C program to take Input an integer (positive or negative) through keyboard, print whether the number entered is negative. Print the absolute value of the number. Multiply the digits of the number and print whether it is greater than 1000 or not.
Q. 5.	Write a C program to take Input a 4-digit integer through keyboard and check if it's divisible by 2, 3, 4, and 12.
Q. 6.	Write a C program to take Input a 4-digit integer through keyboard, print the sum of product of even position digits and odd position digits. For example, if the integer is 2345, then the sum of the product will be 2*4+3*5=23.
Q. 7.	Fibonacci numbers are the numbers in the following integer sequence: 0,1,1,2,3,5,8,13,21...By definition, the first two Fibonacci numbers are 0 and 1, and each subsequent number is the sum of the previous two numbers. Write a program to compute nth number in this series for given input n.
Q. 8.	Write a program which reads an integer x,y,n, and finds the value of constant $e^{x/y}$ using the following series truncated to n terms: $$e^{x/y} = 1 + \cfrac{2x}{2y - x + \cfrac{x^2}{6y + \cfrac{x^2}{10y + \cfrac{x^2}{14y + \cfrac{x^2}{18y + \ddots}}}}}$$
Q. 9.	Write a program that prints the calendar of a month, given the total number of days and the first day of that month. Say, the No. of days is 31 and the first day is Tuesday, then the output looks like what's given below.

M	T	W	T	F	S	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Q. 10.	Write a program that accepts x, and a number n and computes sin(x) and cos(x) using the sine series up to first n terms. The series is:

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	$$\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1)!},$$ $$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \cdots = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{(2n)!}.$$
Q. 11.	According to the Gregorian calendar, it was Monday on the date 01/01/1900. If any year is input through the keyboard write a program to find out what is the day on 1st January of this year. Write a program using conditional operators to determine whether the year entered through the keyboard is a leap year or not.
Q. 12.	Write a program which reads an integer n, and finds the value of π(pi) using Madhava-Leibniz series truncated to n terms: $$\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \ldots + \frac{(-1)^n}{2n+1} + \ldots$$
Q. 13.	Write a program to print the following: * *A* *A*A* *A*A*A*
Q. 14.	Print a triangle of '*'s of height 'r' rows. Now modify your program to print it upside down of given size 'r', where r represents the no. of rows in the triangle.
Q. 15.	Implement a C program that finds all the numbers between 01 and 1000 such that the number itself minus the number reversed is equal to the sum of its digits. For example: 54 is such a number because 54-45 (which is 9) is same as the sum of its digits (5+4 = 9).
Q. 16.	Write a program to read in a command line integer between -999,999,999 and 999,999,999 and print out the English equivalent. Here is an exhaustive list of words that your program should use: negative, zero, one, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, nineteen, twenty, thirty, forty, fifty, sixty, seventy, eighty, ninety, hundred, thousand, million . Don't use hundred, when you can use thousand, e.g., use one thousand five hundred instead of fifteen hundred?
Q. 17.	Write a C program to display and find the sum of the series 1+11+111+....111 upto n. For eg. If n=4, the series is : 1+11+111+1111. Take the value of 'n' as input from the user.
Q. 18.	Write a program to accept two integers' m and n and display the perimeter of a m ×n rectangle using the '*'. Example run: Enter the value of m: 4 Enter the value of n: 7 ******* * * * * *******
Q. 19.	User provides two unsorted 1-D arrays of sizes m and n, write a C program that merges the two into another 1-D array of size m + n such that this new array becomes sorted. The sizes m and n and values in the arrays are also provided by user.

Q. 20.	Write a program in C that takes as input a set of numbers and calculates the mean, variance and standard deviation. (Variance is defined as Σ [(xi - $\bar{x}$)^2]/n - 1 , where xi =i th number in the set, $\bar{x}$ is the mean and n=cardinality of the set ; standard deviation is the square root of variance).
Q. 21.	Amicable numbers are found in pairs. A given pair of numbers is Amicable if the sum of the proper divisors (not including itself) of one number is equal to the other number and vice – versa. For example 220 & 284 are amicable numbers First we find the proper divisors of 220: 220:1, 2, 4, 5, 10, 11, 20, 22, 44, 55, 110 1+ 2 + 4 + 5 + 10 + 11 + 20 + 22 + 44 + 55 + 110 = 284 Now, 284: 1, 2, 4, 71, 142 1 + 2 + 4 + 71 + 142 = 220 Write a C program to check that the input pair of numbers is amicable.
Q. 22.	A triangular number is one which can be represented by that number of pebbles in a symmetric triangle. The first five triangular numbers are 1, 3, 6, 10 and 15. Write a C function int isTriangular(int n) to test if a number 'n' is triangular or not. It should return 1 if it is triangular and 0 if not. T1=1 T2=3 T3=6 T4=10 T5=15
Q. 23.	Write a C program to calculate the volume of the following shapes: Cube, Cuboid, Sphere, Cylinder and Cone. Ask the user which one s/he wants to calculate, and take the appropriate required inputs. Then print the result. The input should be taken in the main function and calculations for every solid should be done in a separate function by passing appropriate arguments.
Q. 24.	Write a C program that take 2 integer sets A[] and b[] as input and prints results of following set operations: i. A union B (Write function set_union()) ii. A intersection B (Write function set_intersection()) iii. A-B and B-A (Write function set_difference())
Q. 25.	Write a program that computes and prints the quotient and remainder of a division of two integers that are accepted from the keyboard.
Q. 26.	N positive integers are entered through the keyboard. Write a function (function name:prime) to obtain the prime factors of this number. Also display the distinct prime factors of this number. For example, prime factors of 24 are 2, 2, 2 and 3, whereas prime factors of 35 are 5 and 7. The distinct prime factors of 24 are 2 and 3, whereas 35 are 5 and 7.
Q. 27.	Write a function (function name: distance) to compute the distance between two points and use it to develop another function (function name: area) that will compute the area of the triangle whose vertices are A(x1, y1), B(x2, y2), and C(x3, y3). Use these to develop a function functions (function name: tritest) which returns a value 1 if the point (x, y) is inside the triangle ABC, otherwise a value 0 for N points, where N points are entered through the keyboard.
Q. 28.	Recursive function (function name: binomial) to find the value of Binomial Coefficient nCr where the boundary conditions are nCr = 1 if r=0 and nCr = 1 if r=n.
Q. 29.	Write a program using C that will take "n" triangles as input. User will also provide the vertices of n-triangles. Write a function "pointTest" which returns an array of integers. a) If a point is inside a triangle, the corresponding value will be the triangle number, b) if the point is inside multiple triangles, then corresponding return value will be the numbers of all such triangles, and c) if the point is not inside any triangle, the value will be 0. The number of points to check is "m" which is also entered through the keyboard. In main function, display the points and corresponding vertices of triangle(s) if it is inside that triangle(s) otherwise print "this point is not inside any triangle". The parameters (arguments) for recursive function "pointTest" will be decided by the programmer.
Q. 30.	A positive integer is entered through the keyboard, write a function (function name:binary) to find the binary equivalent of this number using recursion. For example, if input is 156, then binary value is 10011100.
Q. 31.	Write a recursive function, name of the function is "binomial" to find the value of Binomial Coefficient nCr, where the boundary conditions are nCr = 1 if r=0 and nCr = 1 if r=n. Finally draw

	the Pascal's triangle based on the input value n. Pascal's triangle represents the binomial coefficients.
Q. 32.	A number is called an Armstrong number if the sum of the cubes of the digits of the number is equal to the number. For example 153 = 1^3 + 5^3 + 3^3. Write a C program that asks the user to enter a number and returns if it is Armstrong or not (use function).
Q. 33.	Write a C program to find the reverse of an integer number.
Q. 34.	Write a C program to input n numbers in an array, calculate the sum of all even numbers and all odd numbers in the array and print the larger sum.
Q. 35.	Write a C program, That reads list of n integer and print sum of product of consecutive numbers. if n=7 and numbers are 4,5,2,5,6,4,7 then output is 4*5+5*2+2*5+5*6+6*4+4*7 = 122.
Q. 36.	Find out the ugly prime number Desc: The given number is ugly prime number if it's prime factor contains only among 2,3 or 5. e.g. 20= 2*2*5 is ugly prime number 14=2*7 is not a ugly prime number So write a C function which takes values from 1 to n and returns the number of ugly primes number in it.
Q. 37.	Write a function to find the norm of a matrix. The norm is defined as the square root of the sum of squares of all elements in the matrix.
Q. 38.	Write a program which asks the user to input a radius “r” and a center “(x_0,y_0)” of a circle in the XY-plane. Then ask the user to enter a point (x,y) and check whether the point lies inside, outside or on that circle.
Q. 39.	Define a structure for representing a point in two dimensional Cartesian co-ordinate system. • Write a function to compute the distance between two given points. • Write a function to compute the middle point of the line segment joining two given points. • Write a function to compute the area of a triangle, given the co-ordinates of its 3 vertices.
Q. 40.	Write a program that compares for equality of 2D arrays having 3 rows and 5 columns. Print the unequal values in the form element[m][n] = value and it’s address.
Q. 41.	Write a C Program to Find the Biggest Number in an Array of Numbers using Recursion. This program will implement a one-dimensional array defining elements in unsorted fashion, in which we need to find largest element using Recursion method. The array used here is of type integer.
Q. 42.	Write a C program calculate the standard deviation of a individual series using arrays. To calculate the standard deviation, calculateSD() function is created. The array containing 10 elements is passed to the function and this function calculates the standard deviation and returns it to the main() function.
Q. 43.	A word is considered elfish if it contains the letters: e, l, and f in it, in any order. For example, we would say that the following words are elfish: *whiteleaf, tasteful, unfriendly, and waffes,* because they each contain those letters. Write a predicate function called elfish? That, given a word, tells us if that word is elfish or not.
Q. 44.	Create a structure for smartphone which contains its model name (20 characters), RAM size(in GB), and price(integer). Create two objects from this template, populate its members from the keyboard and print their values.
Q. 45.	Machine precision is defined as the largest number ϵ such that 1 + ϵ = 1. Write a C program to calculate ϵ. Calculate it for both ’float’ and ’double’ data types.
Q. 46.	Write a program that accepts a character from the keyboard and prints whether the character is alphabetic, numeric or neither. The program should also print whether the character is lowercase or uppercase.
Q. 47.	Write a program that accepts the time as hours, minutes and seconds as 3 integers and prints the total number of seconds.
Q. 48.	Define a structure to represent students’ information (name, roll number, cgpa). Read the data corresponding to N students in a structure array, and find out the students with the highest and lowest cgpa values.
Q. 49.	Traditionally in Spain, when children are born, their last name becomes a composite of two last names (surnames). The child’s first surname is traditionally the father’s first surname and the child’s second surname is the mother’s first surname. In their

	example, if "*Eduardo Fernández Garrido* marries a woman named *María Dolores Martínez Ruiz* and they have a child named *José*, there are several legal options, but their child would most usually be known as *José Fernández Martínez*." For this assignment, you are going to ask the user for the father's first name, first surname and second surname, and do the same for the mother. Then, ask for the first name of the child. Finally, you will print out the traditional Spanish name of the child.
	`Sample Output:`
	`Enter the father's first name:` **`Juan Carlos`**
	`Enter the father's first surname:` **`Garrido-Leon`**
	`Enter the father's second surname:` **`Campanella`**
	`Enter the mother's first name:` **`Ana Maria`**
	`Enter the mother's first surname:` **`Perez`**
	`Enter the mother's second surname:` **`Vidal`**
	`Enter the child's first name:` **`Miguel Antonio`**
	`Parents Juan Carlos and Ana Maria`
	`will have a child named Miguel Antonio Garrido-Leon Perez.`

Q. 50.	*Yeah, right…* Everyone has seen advertisements that show incredibly fit people working out using some kind of new, but bizarre, apparatus. The claim is that you can burn a whole lot of calories in only a few minutes per day! Running appears to be one of the highest burning activities at nearly 5.2 calories. So the question is, how many hours will take to use one of these new devices to burn a certain amount of pounds? If one pound of fat is 3,600 calories, let's find out.
	For this assignment, you will ask the user for the name of the device, the number of calories it burns per pound per hour, the weight of the user, the total amount of weight the user wants to lose. It will then calculate the number of hours the user needs to spend working out.
	`Sample Output #1:`
	`Enter the name of the device:` **`Flexinator`**
	`Enter its calorie rate per pound per hour:` **`5`**
	`Enter your weight:` **`200`**
	`Enter the amount of weight to lose:` **`20`**
	`Burn rate is 1000 calories per hour.`
	`It will take ~4 hours to lose one pound.`
	`It will take ~72 hours to lose 20 lbs using the Flexinator.`

Q. 51.	Write a program that takes 10 words (strings) from user and sorts elements in lexicographical (dictionary) order. The program will contain a function for sorting (function name sorting).