ASSIGNMENT

Exercise 1: Write a program to convert English units to metric (i.e., miles to kilometers, gallons to liters, etc.). Include a specification and a code design.

```c
#include <stdio.h>

float milesToKm(float);
float gallonToLiters(float);
int main() {
    float n;
    int options;
    printf("Enter an Option : \n 1. Convert Miles to Kilometers \n 2. Convert Gallons to
Liters \n Choose an Option : \t");
    scanf("%d", &options);
    switch (options) {
        case 1:
            printf("Enter distance in miles: ");
            scanf("%f", &n);
            printf("%.2f miles = %.2f kilometers\n", n, milesToKm(n));
            break;
        case 2:
            printf("Enter Gallons: ");
            scanf("%f", &n);
            printf("%.2f gallons = %.2f liters\n", n, gallonToLiters(n));
            break;
        default:
            printf("Enter a Valid Option\n");
            break;
    }
    return 0;
}
float milesToKm(float num) {
    return num * 1.609344;
}
float gallonToLiters(float num) {
    return num * 3.785;
}
```

Enter an Option :
1. Convert Miles to Kilometers
2. Convert Gallons to Liters
Choose an Option : 1
Enter distance in miles :5
5.00 miles = 8.05 kilometers
Enter an Option :
1. Convert Miles to Kilometers
2. Convert Gallons to Liters
Choose an Option : 2
Enter Gallons :5
5.00 gallons = 18.92 liters

Exercise 2: Write a program to perform date arithmetic such as how many days there are between 6/6/90 and 4/3/92. Include a specification and a code design.

```c
#include <stdio.h>
int isLeapYear(int year);
int countDays(int day, int month, int year);
int daysBetween(int day1, int month1, int year1, int day2, int month2, int year2);
int main() {
    int day1, month1, year1;
    int day2, month2, year2;
    int days;
```

```
    printf("Enter the first date (dd mm yyyy): ");
    scanf("%d %d %d", &day1, &month1, &year1);
    printf("Enter the second date (dd mm yyyy): ");
    scanf("%d %d %d", &day2, &month2, &year2);
    days = daysBetween(day1, month1, year1, day2, month2, year2);
    printf("Number of days : %d",days);
    return 0;
}
int isLeapYear(int year) {
    return (year % 4 == 0 && year % 100 != 0) || (year % 400 == 0);
}
int countDays(int day, int month, int year) {
    static int monthDays[12] = { 31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31 };
    int days = year * 365 + day;
    for (int i = 0; i < month - 1; i++) {
        days += monthDays[i];
    }
    days += year / 4 - year / 100 + year / 400;
    if (month > 2 && isLeapYear(year)) {
        days++;
    }
    return days;
}
int daysBetween(int day1, int month1, int year1, int day2, int month2, int year2) {
    return countDays(day2, month2, year2) - countDays(day1, month1, year1);
}
```

Enter the first date (dd mm yyyy): 23 02 2001
Enter the second date (dd mm yyyy): 18 01 2006
Number of days : 1790

Exercise 3: A serial transmission line can transmit 960 characters each second. Write a program that will calculate the time required to send a file, given the file's size. Try the prog ram on a 400MB (419,430,400 -byte) file. Use appropriate units. (A 400MB file takes days.)

```
#include<stdio.h>

void transmission_time(long file_size,int transmission_rate);
int main(){
    long file_size=419430400;
    int transmission_rate=960;
    transmission_time(file_size,transmission_rate);
    return 0;
}
void transmission_time(long file_size,int transmission_rate){
    double time_in_second=file_size/transmission_rate;
    double time_in_minutes=time_in_second/60;
    double time_in_hours=time_in_minutes/60;
    int time_in_days=time_in_hours/24;
    printf("Time Required for a file size of %ld bytes is : \n ",file_size);
    printf("Seconds : %.2f\n",time_in_second);
    printf("Minutes : %.2f\n",time_in_minutes);
    printf("Hours : %.2f\n",time_in_hours);
    printf("Days : %d\n",time_in_days);
}
```

```
Time Required for a file size of 419430400 bytes is :
 Seconds : 436906.00
Minutes : 7281.77
Hours : 121.36
Days : 5
```

Exercise 4: Write a program to add an 8% sales tax to a given amount and round the result to the nearest penny.

```c
#include <stdio.h>
#include <math.h>

int main() {
    float amount, totalAmount, taxRate = 0.08;
    printf("Enter the Amount: ");
    scanf("%f", &amount);
    totalAmount = amount + (amount * taxRate);
    totalAmount = round(totalAmount * 100) / 100;
    printf("Total Amount after adding 8%% sales tax: $%.2f\n", totalAmount);
    return 0;
}
```

Enter the Amount: 50
Total Amount after adding 8% sales tax: $54.00

Exercise 5: Write a program to tell if a number is prime.

```c
#include <stdio.h>

int isPrime(int number);
int main() {
    int number;
    printf("Enter a number: ");
    scanf("%d", &number);
    if (isPrime(number)) {
        printf("%d is a prime number.\n", number);
    } else {
        printf("%d is not a prime number.\n", number);
    }
    return 0;
}
int isPrime(int number) {
    if (number <= 1) {
        return 0;
    }
    for (int i = 2; i <= number / 2; i++) {
        if (number % i == 0) {
            return 0;
        }
    }
    return 1;
}
```

Enter a number: 7
7 is a prime number.

Exercise 6: Write a program that takes a series of numbers and counts the number of positive and negative values.

```c
#include <stdio.h>
int main() {
    int count, number, positiveCount = 0, negativeCount = 0;
    printf("Enter the number of values you want to input: ");
    scanf("%d", &count);
    for (int i = 0; i < count; i++) {
        printf("Enter a number: ");
        scanf("%d", &number);

        if (number >= 0) {
```

```
            positiveCount++;
        } else if (number < 0) {
            negativeCount++;
        }
    }
    printf("Positive numbers count: %d\n", positiveCount);
    printf("Negative numbers count: %d\n", negativeCount);
    return 0;
}
```

Enter a number: 1
Enter a number: -4
Enter a number: 8
Enter a number: 3
Enter a number: 0
Enter a number: -2
Enter a number: 9
Enter a number: 2
Enter a number: 7
Positive numbers count: 7
Negative numbers count: 2

1.C program to find the HCF of given numbers using recursion

```
#include<stdio.h>
int hcf(int n,int m);
int main(){
    int a,b;
    printf("Enter first number :");
    scanf("%d",&a);
    printf("Enter second number :");
    scanf("%d",&b);
    printf("HCF of %d and %d = %d",a,b,hcf(a,b));
    return 0;
}
int hcf(int n,int m){
    if(m==0){
        return n;
    }
    else{
        return hcf(m,n%m);
    }
}
```

Enter first number :8
Enter second number :12
HCF of 8 and 12 = 4

2.C program to find the LCM of given numbers using recursion

```
#include<stdio.h>

int hcf(int n,int m);
int lcm(int n,int m);
int main(){
    int a,b;
    printf("Enter first number :");
    scanf("%d",&a);
    printf("Enter second number :");
    scanf("%d",&b);
    printf("LCM of %d and %d = %d",a,b,lcm(a,b));
    return 0;
```

```
}
int hcf(int n,int m){
    if(m==0){
        return n;
    }
    else{
        return hcf(m,n%m);
    }
}
int lcm(int n,int m){
    int lcm_of_numbers=(n*m)/hcf(n,m) ;
    return lcm_of_numbers;
}
```

Enter first number :8
Enter second number :12
LCM of 8 and 12 = 24

3.C program to find the GCD of given numbers using recursion

```
#include <stdio.h>
int gcd(int a, int b);
int main() {
    int num1, num2;
    printf("Enter two numbers: ");
    scanf("%d %d", &num1, &num2);
    printf("GCD of %d and %d is %d\n", num1, num2, gcd(num1, num2));
    return 0;
}
int gcd(int a, int b) {
    if (b == 0)
        return a;
    return gcd(b, a % b);
}
```

Enter two numbers: 4
8
GCD of 4 and 8 is 4

4. C program to convert a Decimal number to Binary using Recursion

```
#include <stdio.h>

void decimal_to_binary(int num);
int main() {
    int n;
    printf("Enter a Number: ");
    scanf("%d", &n);
    if (n == 0) {
        printf("0\n");
    } else {
        printf("%d to Binary = ", n);
        decimal_to_binary(n);
        printf("\n");
    }
    return 0;
}
void decimal_to_binary(int num) {
    if (num > 0) {
        decimal_to_binary(num / 2);
```

```
        printf("%d", num % 2);
    }
}
```

Enter a Number: 5
5 to Binary = 101

5.C program to convert Binary Number to Gray Code

```
#include <stdio.h>

int binaryToGray(int num);
int main() {
    int binary;
    printf("Enter a binary number: ");
    scanf("%d", &binary);
    int gray = binaryToGray(binary);
    printf("Binary %d to Gray Code = %d\n", binary, gray);
    return 0;
}
int binaryToGray(int num) {
    return num ^ (num >> 1);
}
```

Enter a binary number: 5
Binary 5 to Gray Code = 7

6.C program to convert Binary Number to Gray Code using Recursion

```
#include <stdio.h>

int bintogray(int);

int main ()
{
    int bin, gray;

    printf("Enter a binary number: ");
    scanf("%d", &bin);
    gray = bintogray(bin);
    printf("The gray code of %d is %d\n", bin, gray);
    return 0;
}

int bintogray(int bin)
{
    int a, b, result = 0, i = 0;

    if (!bin)
    {
        return 0;
    }
    else
    {
        a = bin % 10;
        bin = bin / 10;
        b = bin % 10;
        if ((a && !b) || (!a && b))
        {
            return (1 + 10 * bintogray(bin));
        }
        else
        {
            return (10 * bintogray(bin));
```

```
        }
    }
}
```

Enter a binary number: 101
The gray code of 101 is 111

7. C program to print following Pyramid:

```
**********
****   ****
***     ***
**       **
*         *
```

```c
#include <stdio.h>

int main() {
    int rows = 5; // Number of rows in the pyramid
    for (int i = 1; i <= rows; i++) {
        // Print spaces before the stars
        for (int j = 1; j <= rows - i; j++) {
            printf(" ");
        }
        // Print stars for the left half
        for (int j = 1; j <= i; j++) {
            printf("*");
        }
        // Print spaces between the left and right halves
        for (int j = 1; j <= 2 * (rows - i) - 1; j++) {
            printf(" ");
        }
        // Print stars for the right half
        for (int j = 1; j <= i; j++) {
            printf("*");
        }
        printf("\n");
    }
    return 0;
}
```

8. C program to find the sum of Natural Number/Factorial of Number of all natural numbers from 1 to N.

Series: 1/1! + 2/2! + 3/3! + 4/4! + ... N/N!

```c
#include <stdio.h>

int main() {
    int N;
    printf("Enter the value of N: ");
    scanf("%d", &N);
    double sum = 0.0;
    double factorial = 1.0;
    for (int i = 1; i <= N; i++) {
        factorial *= i;
        sum += (double)i / factorial;
    }
    printf("The sum of the series is: %.2f\n", sum);
    return 0;
}
```

9. C program to find sum of following series:

1 + 3^2/3^3 + 5^2/5^3 + 7^2/7^3 + ... till N terms

```c
#include <stdio.h>
#include <math.h>

int main(){
    int limits;
    printf("Enter the limits:");
    scanf("%d",&limits);

    float sum = 1;
    printf("Series is 1 + ");
    for(int i=2;i<=limits;i++){
        if(i%2 != 0){
            float term = pow(i, 2) / pow(i, 3);
            sum += term ;
            printf("%d^2 / %d^3 +",i,i);

        }
    }

    printf("Sum of series = %.2f",sum);
    return 0;
}
```

Enter the limits:5
Series is 1 + 3^2 / 3^3 +5^2 / 5^3 +Sum of series = 1.53

10.C program to replace all EVEN elements by 0 and odd by 1 in one dimensional array

```c
#include<stdio.h>
int main(){
    int n;
    printf("Enter Number of elements needed in an array");
    scanf("%d",&n);
    int arr[n];
    printf("Enter %d Elements\n",n);
    for(int i=0;i<n;i++){
        scanf("%d",&arr[i]);
    }
    for(int i=0;i<n;i++){
        if(arr[i]%2==0){
            arr[i]=0;
        }
        else{
            arr[i]=1;
        }
    }
    for(int i=0;i<n;i++){
        printf("arr[%d] = %d \n",i,arr[i]);
    }
    return 0;
}
```

Enter 5 Elements
1
2
3

4
5
arr[0] = 1
arr[1] = 0
arr[2] = 1
arr[3] = 0
arr[4] = 1

11.C program to read a matrix and print diagonals

```c
#include<stdio.h>

int main(){
    int m,n;
    printf("Enter number of rows(n) and columns(n) in a matrix:\n");
    scanf("%d %d",&m,&n);
    int arr[m][n];
    printf("Enter Elements for Matrix\n");
    for(int i=0;i<n;i++){
        for(int j=0;j<m;j++){
            printf("arr[%d][%d] = \t",i,j);
            scanf("%d",&arr[i][j]);
        }
    }
    printf("Diagonal Elements are: \n");
    for(int i=0;i<n;i++){
        for(int j=0;j<m;j++){
            if(i==j){
                printf("arr[%d][%d]=%d\n",i,j,arr[i][j]);
            }
        }
    }

}
```

Enter number of rows(n) and columns(n) in a matrix:
2 2
Enter Elements for Matrix
arr[0][0] = 3
arr[0][1] = 2
arr[1][0] = 4
arr[1][1] = 5
Diagonal Elements are:
arr[0][0]=3
arr[1][1]=5

12.C program to print the upper triangular portion of a 3x3 matrix

```c
#include <stdio.h>
int main() {
    int matrix[3][3];
    printf("Enter the elements of the 3x3 matrix:\n");
    for (int i = 0; i < 3; i++) {
        for (int j = 0; j < 3; j++) {
            scanf("%d", &matrix[i][j]);
        }
    }
```

```
    printf("Upper Triangular Portion of the Matrix:\n");
    for (int i = 0; i < 3; i++) {
        for (int j = 0; j < 3; j++) {
            if (j >= i) {
                printf("%d ", matrix[i][j]);
            } else {
                printf("  ");
            }
        }
        printf("\n");
    }
```

```
    return 0;
}
```

Upper Triangular Portion of the Matrix:
4 9 0
 8 3
  1

13. C program to input and print text using dynamic memory allocation

```
#include <stdio.h>
#include <stdlib.h>
int main() {
    char *text;
    int n;
    printf("Enter the number of characters in the text: ");
    scanf("%d", &n);
    text = (char *)malloc((n + 1) * sizeof(char));
    if (text == NULL) {
        printf("Memory allocation failed!\n");
        return 1;
    }
    printf("Enter the text: ");
    scanf(" ");
    scanf("%[^\n]", text);
    printf("You entered: %s\n", text);
    free(text);
    return 0;
}
```

Enter the number of characters in the text: 10
Enter the text: soumya
You entered: soumya

14.C program to read a one dimensional array,print sum of all elements along with inputted array elements along with inputted array elements using Dynamic Memory Allocation

```
#include <stdio.h>
#include <stdlib.h>

int main() {
    int n;
    int sum = 0;
    printf("Enter the number of elements in the array: ");
    scanf("%d", &n);
    int *arr = (int *)malloc(n * sizeof(int));
    if (arr == NULL) {
        printf("Memory allocation failed!\n");
```

```
        return 1;
    }
    printf("Enter %d elements:\n", n);
    for (int i = 0; i < n; i++) {
        scanf("%d", &arr[i]);
    }
    printf("Array elements are:\n");
    for (int i = 0; i < n; i++) {
        printf("%d ", arr[i]);
        sum += arr[i];
    }
    printf("\n");
    printf("Sum of all elements = %d\n", sum);
    free(arr);
    return 0;
}
```

15.C program to read a one dimensional array,print sum of all elements along with inputted array elements along with inputted array elements using Dynamic Memory Allocation

```
#include <stdio.h>
#include <stdlib.h>

int main() {
    int n;
    int sum = 0;
    printf("Enter the number of elements in the array: ");
    scanf("%d", &n);
    int *arr = (int *)malloc(n * sizeof(int));
    if (arr == NULL) {
        printf("Memory allocation failed!\n");
        return 1;
    }
    printf("Enter %d elements:\n", n);
    for (int i = 0; i < n; i++) {
        scanf("%d", &arr[i]);
    }
    printf("Array elements are:\n");
    for (int i = 0; i < n; i++) {
        printf("%d ", arr[i]);
        sum += arr[i];
    }
    printf("\n");
    printf("Sum of all elements = %d\n", sum);
    free(arr);
    return 0;
}
```

Enter the number of elements in the array: 4
Enter 4 elements:
1
2
3
4
Array elements are:
1 2 3 4
Sum of all elements = 10