C LAB
WEEK 1

1d. Hello World

Program :

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

int main()
{

   char s[100];
   scanf("%[^\n]", &s);

   printf("Hello, World!\n");
   printf("%s",s);
   return 0;
}
```

Expected Output:-

Hello, World!

Welcome to C programming.

1e. Write a simple program to read int, float, char and string using scanf() and display using printf() in all the above given platforms.

```
#include <stdio.h>
int main()
{
   int integer;
   float floatingPoint;
   char character;
   char string[100];

   // Reading values
   printf("Enter an integer: ");
   scanf("%d", &integer);

   printf("Enter a floating-point number: ");
   scanf("%f", &floatingPoint);
```

```
    printf("Enter a character: ");
    scanf(" %c", &character);

    printf("Enter a string: ");
    scanf(" %s", string);

    // Displaying values
    printf("\nInteger: %d\n", integer);
    printf("Float: %f\n", floatingPoint);
    printf("Character: %c\n", character);
    printf("String: %s\n", string);

    return 0;
}
```

ExpectedOutput:-

Enter an integer: 23

Enter a floating-point number: 423

Enter a character: f

Enter a string: Happylife

Integer: 23

Float: 423.000000

Character: f

String: Happylife

WEEK 2

2a. Sum and Difference of 2 numbers.

Program:-

```
#include <stdio.h>
#include <string.h>
#include <math.h>
#include <stdlib.h>
int main()
{
    int a,b;
    float c,d;
    scanf("%d%d",&a,&b);
    scanf("%f%f",&c,&d);
    printf("%d %d \n",a+b,a-b);
```

```
    printf("%.1f %.1f",c+d,c-d);
    return 0;
}
```

Excepted Output:-

Input (stdin)

10 4
4.0 2.0

Expected Output1:-

14 6
6.0 2.0

Input (stdin)

10 50
2.34 4.56

Expected Output

60 -40
6.9 -2.2

2b.Playing with Characters.

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

int main()
{
    /* Enter your code here. Read input from STDIN. Print output to STDOUT */
    char ch, s[100],sen[122];
    scanf("%c",&ch);
    scanf("%s\n",&s);
    scanf("%[^\n]s",&sen);
    printf("%c\n%s\n%s",ch,s,sen);
    return 0;
}
```

OUTPUT:-

Input (stdin)

C
Language
Welcome To C!!

Your Output (stdout)

C

Language
Welcome To C!!

Expected Output

C
Language
Welcome To C!!

2c. Bitwise Operators.

Program:-

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

void calculate_the_maximum(int n, int k) {
 int max_and = 0, max_or = 0, max_xor = 0;
    for (int i = 1; i <= n; i++) {
        for (int j = i + 1; j <= n; j++) {
            int temp_and = i & j;
            int temp_or = i | j;
            int temp_xor = i ^ j;
            if (temp_and > max_and && temp_and < k) {
                max_and = temp_and;
            }
            if (temp_or > max_or && temp_or < k) {
                max_or = temp_or;
            }
            if (temp_xor > max_xor && temp_xor < k) {
                max_xor = temp_xor;
            }
        }
    }
    printf("%d\n%d\n%d", max_and, max_or, max_xor);
}

int main() {
    int n, k;

    scanf("%d %d", &n, &k);
    calculate_the_maximum(n, k);

    return 0;
}
```

OUTPUT:-

Input (stdin)

5 4

Expected Output

2
3
3

Expected Output2:-

Input (stdin)

5 5

Output

4
3
4

2d. Conversion of Fahreinheit to Celsius and Vice Versa.

```
#include <stdio.h>
int main()
{
    int choice;
   double temperature, converted_temperature;

   printf("Temperature Conversion Menu:\n");
   printf("1. Fahrenheit to Celsius\n");
   printf("2. Celsius to Fahrenheit\n");
   printf("Enter your choice (1 or 2): ");
   scanf("%d", &choice);

   if (choice == 1) {
      printf("Enter temperature in Fahrenheit: ");
      scanf("%lf", &temperature);
      converted_temperature = (temperature - 32) * 5 / 9;
```

```
        printf("%.2lf°F is equal to %.2lf°C\n", temperature, converted_temperature);
    } else if (choice == 2) {
        printf("Enter temperature in Celsius: ");
        scanf("%lf", &temperature);
        converted_temperature = (temperature * 9 / 5) + 32;
        printf("%.2lf°C is equal to %.2lf°F\n", temperature, converted_temperature);
    } else {
        printf("Invalid choice. Please enter 1 or 2.\n");
    }
    return 0;
}
```

Expected Output1:-

Temperature Conversion Menu:

1. Fahrenheit to Celsius

2. Celsius to Fahrenheit

Enter your choice (1 or 2): 1

Enter temperature in Fahrenheit: 48

48.00 F is equal to 8.89 C

Expected Output2:-

Temperature Conversion Menu:

1. Fahrenheit to Celsius

2. Celsius to Fahrenheit

Enter your choice (1 or 2): 2

Enter temperature in Celsius: 18

18.00 C is equal to 64.40 F

2e)Distance travelled by an object.

```
#include <stdio.h>
int main() {
    double speed, time, distance;
```

```
    // Input the speed in meters per second
    printf("Enter the speed (m/s): ");
    scanf("%lf", &speed);

    // Input the time in seconds
    printf("Enter the time (s): ");
    scanf("%lf", &time);

    // Calculate the distance
    distance = speed * time;

    // Output the distance
    printf("Distance traveled: %.2lf meters\n", distance);

    return 0;
}
```

Expected Output:-

Enter the speed (m/s): 90

Enter the time (s): 120

Distance traveled: 10800.00 meters

Expected Output2:-

Enter the speed (m/s): 100

Enter the time (s): 60

Distance traveled: 6000.00 meters

2f) Calculate Simple interest and compound interest.

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

int main() {
    double principal, rate, time, simple_interest, compound_interest;
```

```
    // Input principal amount, interest rate, and time period
    printf("Enter the principal amount: ");
    scanf("%lf", &principal);
    printf("Enter the annual interest rate (in percentage): ");
    scanf("%lf", &rate);
    printf("Enter the time period (in years): ");
    scanf("%lf", &time);

    // Calculate Simple Interest
    simple_interest = (principal * rate * time) / 100;

    // Calculate Compound Interest
    compound_interest = principal * (pow(1 + (rate / 100), time) - 1);

    // Output the results
    printf("\nSimple Interest = %.2lf\n", simple_interest);
    printf("Compound Interest = %.2lf\n", compound_interest);

    return 0;
}
```

Expected Output1:-

```
Enter the principal amount: 100000
Enter the annual interest rate (in percentage): 10
Enter the time period (in years): 3

Simple Interest = 30000.00
Compound Interest = 33100.00
```

Expected Output 2:-

```
Enter the principal amount: 200000
Enter the annual interest rate (in percentage): 12
Enter the time period (in years): 2

Simple Interest = 48000.00
Compound Interest = 50880.00
```

WEEK 3

3a. Evaluate the following expressions

i. a/b*c-b+a*d/3

ii. j = (i++) + (++i)

```
#include <stdio.h>
int main()
 {
   double a, b, c, d;
   double result;
   // Input values for a, b, c, and d
   printf("Enter the value of a: ");
   scanf("%lf", &a);
   printf("Enter the value of b: ");
   scanf("%lf", &b);
   printf("Enter the value of c: ");
   scanf("%lf", &c);
   printf("Enter the value of d: ");
   scanf("%lf", &d);

   // Evaluate the expression
   result = a / b * c - b + a * d / 3;
   // Output the result
   printf("Result: %.2lf\n", result);
   return 0;
}
```

Expected Output1:-

```
Enter the value of a: 3
Enter the value of b: 4
Enter the value of c: 5
Enter the value of d: 4
```

Result: 3.75

Expected Output2:-

Enter the value of a: 2

Enter the value of b: 5

Enter the value of c: 6

Enter the value of d: 4

Result: 0.07

ii)

```
#include <stdio.h>

int main()
 {
    int i,j;

    printf(“enter the value of i:”);
    scanf(“%d”,&i);

    j = (i++) + (++i);

    printf("j value is : %d\n", j);

    return 0;
}
```

OUTPUT:-

enter the value of i : 7

j value is : 16

3b) Square root of a given number.

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

int main() {
    double number, squareRoot;

    // Input the number
    printf("Enter a number: ");
```

```
    scanf("%lf", &number);

    // Calculate the square root
    if (number >= 0) {
        squareRoot = sqrt(number);
        printf("Square root of %.2lf is %.2lf\n", number, squareRoot);
    } else {
        printf("Invalid input. Square root is not defined for negative numbers.\n");
    }

    return 0;
}
```

ExpectedOutput1:-

Enter a number: 64

Square root of 64.00 is 8.00

Expected Output2:-

Enter a number: 49

Square root of 49.00 is 7.00

3c) Find the area of circle, square, rectangle and triangle.

Area of a Circle:

```
#include <stdio.h>
#include <math.h>
int main() {
    double radius, area;
    printf("Enter the radius of the circle: ");
    scanf("%lf", &radius);

    if (radius >= 0) {
        area = M_PI * pow(radius, 2);
        printf("Area of the circle: %.2lf\n", area);
    } else {
        printf("Invalid input. Radius cannot be negative.\n");
    }
```

```
    return 0;
}
```

ExpectedOtput1:-

Enter the radius of the circle: 3

Area of the circle: 28.27

ExpectedOutput2:-

Enter the radius of the circle: 25

Area of the circle: 1963.50

Area of the square:-

```
#include <stdio.h>

int main() {
    double side, area;

    printf("Enter the side length of the square: ");
    scanf("%lf", &side);

    if (side >= 0) {
        area = side * side;
        printf("Area of the square: %.2lf\n", area);
    } else {
        printf("Invalid input. Side length cannot be negative.\n");
    }

    return 0;
}
```

ExpectedOutput1:-

Enter the side length of the square: 5

Area of the square: 25.00

ExpectedOutput2:-

Enter the side length of the square: 25

Area of the square: 625.00

Area of Rectangle:-

```
#include <stdio.h>

int main() {
    double length, width, area;

    printf("Enter the length of the rectangle: ");
    scanf("%lf", &length);
    printf("Enter the width of the rectangle: ");
    scanf("%lf", &width);

    if (length >= 0 && width >= 0) {
        area = length * width;
        printf("Area of the rectangle: %.2lf\n", area);
    } else {
        printf("Invalid input. Length and width cannot be negative.\n");
    }

    return 0;
}
```

ExpectedOutput1:-

Enter the length of the rectangle: 4

Enter the width of the rectangle: 5

Area of the rectangle: 20.00

ExpectedOutput2:-

Enter the length of the rectangle: 25

Enter the width of the rectangle: 45

Area of the rectangle: 1125.00

Area of a Triangle:

```
#include <stdio.h>

int main() {
    double base, height, area;

    printf("Enter the base of the triangle: ");
    scanf("%lf", &base);
    printf("Enter the height of the triangle: ");
    scanf("%lf", &height);

    if (base >= 0 && height >= 0) {
        area = 0.5 * base * height;
        printf("Area of the triangle: %.2lf\n", area);
    } else {
        printf("Invalid input. Base and height cannot be negative.\n");
    }
    return 0;
}
```

ExpectedOutput1:-

Enter the base of the triangle: 4

Enter the height of the triangle: 3

Area of the triangle: 6.00

ExpectedOutput2:-

Enter the base of the triangle: 34

Enter the height of the triangle: 12

Area of the triangle: 204.00

OR

```
#include <stdio.h>
int main()
{
   double radius,side,length,breadth,base,height;
   double circle,square,rectangle,triangle;
   printf("enter the values of radius,side,length,breadth,base,height :");

scanf("%lf%lf%lf%lf%lf%lf",&radius,&side,&length,&breadth,&base,&height
);
   circle=3.14*radius*radius;
   square=side*side;
   rectangle=length*breadth;
   triangle=0.5*(base*height);
   printf("\narea of cirlce is:%lf",circle);
   printf("\narea of square is:%lf",square);
   printf("\narea of rectangle is:%lf",rectangle);
   printf("\narea of triangle is:%lf",triangle);
   return 0;
}
```

EXPCTED OUTPUT:

```
enter the values of radius,side,length,breadth,base,height: 2 3 4 5 6 7
area of cirlce is:12.560000
area of square is:9.000000
area of rectangle is:20.000000
area of triangle is:21.000000
```

3d) Find the maximum of three numbers using conditional operator.

```
#include <stdio.h>
int main() {
   int num1, num2, num3, max;
   printf("Enter three numbers: ");
   scanf("%d %d %d", &num1, &num2, &num3);
```

```
    // Use the conditional operator to find the maximum
    max = (num1 > num2) ? ((num1 > num3) ? num1 : num3) : ((num2 > num3) ? num2 : num3);
    printf("The maximum of %d, %d, and %d is: %d", num1, num2, num3, max);
    return 0;
}
```

Expectedoutput1:-

Enter three numbers: 5 4 3

The maximum of 5, 4, and 3 is: 5

Expected Output2:-

Enter three numbers: 8 7 6

The maximum of 8, 7, and 6 is: 8

3e) Take marks of 5 subjects in integers, find the total in integer and average in float.

```
#include <stdio.h>
int main()
{
int marks[5];   // An array to store marks of 5 subjects
int total = 0;  // Variable to store the total marks
float average;  // Variable to store the average

// Input marks for 5 subjects
printf("Enter marks for 5 subjects:\n");
for (int i = 0; i < 5; i++)
 {
   printf("Subject %d: ", i + 1);
   scanf("%d", &marks[i]);
   total += marks[i];  // Add the marks to the total
}
// Calculate the average
```

```
    average = (float)total / 5;  // Convert the total to a float for accurate average

    // Output the total and average
    printf("Total marks: %d\n", total);
    printf("Average marks: %.2f\n", average);

    return 0;
}
```

ExpectedOutput1:

Enter marks for 5 subjects:

Subject 1: 98

Subject 2: 68

Subject 3: 78

Subject 4: 87

Subject 5: 76

Total marks: 407

Average marks: 81.40

ExpectedOutput2:-

Enter marks for 5 subjects:

Subject 1: 67

Subject 2: 76

Subject 3: 56

Subject 4: 85

Subject 5: 56

Total marks: 340

Average marks: 68.00

WEEK 4

```
#include <assert.h>
#include <limits.h>
#include <math.h>
#include <stdbool.h>
#include <stddef.h>
#include <stdint.h>
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

char* readline();
int main()
{
    char* n_endptr;
    char* n_str = readline();
    int n = strtol(n_str, &n_endptr, 10);

    if (n_endptr == n_str || *n_endptr != '\0') { exit(EXIT_FAILURE); }

    // Write Your Code Here
    switch(n)
    {
        case 1:printf("one \n");
        break;
        case 2:printf("two \n");
        break;
        case 3:printf("three \n");
        break;
         case 4:printf("four \n");
        break;
        case 5:printf("five \n");
```

```
        break;
        case 6:printf("six\n");
        break;
         case 7:printf("seven\n");
        break;
        case 8:printf("eight \n");
        break;
        case 9:printf("nine \n");
        break;
        default :printf("Greater than 9");
        break;
    }

    return 0;
}

char* readline() {
    size_t alloc_length = 1024;
    size_t data_length = 0;
    char* data = malloc(alloc_length);

    while (true) {
        char* cursor = data + data_length;
        char* line = fgets(cursor, alloc_length - data_length, stdin);

        if (!line) { break; }

        data_length += strlen(cursor);

        if (data_length < alloc_length - 1 || data[data_length - 1] == '\n') { break; }

        size_t new_length = alloc_length << 1;
```

```
        data = realloc(data, new_length);

        if (!data) { break; }

        alloc_length = new_length;
    }

    if (data[data_length - 1] == '\n') {
        data[data_length - 1] = '\0';
    }

    data = realloc(data, data_length);

    return data;
}
```

ExpectedOuput1:-

Input (stdin)

8

Expected Output

Eight

ExpectedOutput2:-

Input (stdin)

10

Expected Output

Greater than 9

4B) Roots of a Quadratic Equation.

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

int main() {
    double a, b, c;
```

```
    double discriminant, root1, root2;

    printf("Enter the coefficients of the quadratic equation (a, b, and c): ");
    scanf("%lf %lf %lf", &a, &b, &c);

    // Calculate the discriminant
    discriminant = (b * b) - (4 * a * c);

    // Check the value of the discriminant
    if (discriminant > 0) {
        // Two real and distinct roots
        root1 = (-b + sqrt(discriminant)) / (2 * a);
        root2 = (-b - sqrt(discriminant)) / (2 * a);
        printf("Root 1: %.2lf\n", root1);
        printf("Root 2: %.2lf\n", root2);
    } else if (discriminant == 0) {
        // One real root (repeated)
        root1 = -b / (2 * a);
        printf("Root: %.2lf\n", root1);
    } else {
        // Complex roots
        double realPart = -b / (2 * a);
        double imaginaryPart = sqrt(-discriminant) / (2 * a);
        printf("Root 1: %.2lf + %.2lfi\n", realPart, imaginaryPart);
        printf("Root 2: %.2lf - %.2lfi\n", realPart, imaginaryPart);
    }

    return 0;
}
```

ExpectedOtput1:-

Enter the coefficients of the quadratic equation (a, b, and c): 8

6

4

Root 1: -0.38 + 0.60i

Root 2: -0.38 - 0.60i

ExpectedOutput2:-

Enter the coefficients of the quadratic equation (a, b, and c): 8

4

5

Root 1: -0.25 + 0.75i

Root 2: -0.25 - 0.75i

4C) Generate electricity bill.

```
#include <stdio.h>
int main() {
    // Constants for billing rates
    double unitRate = 0.15;  // Cost per unit of electricity in dollars
    double fixedCharge = 10.0;  // Fixed monthly charge in dollars

    // Customer information
    char customerName[50];
    int customerId;
    int unitsConsumed;

    // Input customer information
    printf("Enter customer name: ");
    fgets(customerName, sizeof(customerName), stdin);
    printf("Enter customer ID: ");
    scanf("%d", &customerId);
    printf("Enter units consumed: ");
    scanf("%d", &unitsConsumed);

    // Calculate total cost
```

```
    double totalCost = fixedCharge + (unitsConsumed * unitRate);

    // Generate the electricity bill
    printf("\nElectricity Bill\n");
    printf("Customer Name: %s", customerName);
    printf("Customer ID: %d\n", customerId);
    printf("Units Consumed: %d\n", unitsConsumed);
    printf("Cost per Unit: $%.2lf\n", unitRate);
    printf("Fixed Monthly Charge: $%.2lf\n", fixedCharge);
    printf("Total Cost: $%.2lf\n", totalCost);

    return 0;
}
```

ExpectedOutput1:-

Enter customer name: RAM

Enter customer ID: 34557568758

Enter units consumed: 234

Electricity Bill

Customer Name: RAM

Customer ID: 197830390

Units Consumed: 234

Cost per Unit: $0.15

Fixed Monthly Charge: $10.00

Total Cost: $45.10

ExpectedOutput2:-

Enter customer name: 637884

Enter customer ID: 32144

Enter units consumed: 30

Electricity Bill

Customer Name: 637884

Customer ID: 32144

Units Consumed: 30

Cost per Unit: $0.15

Fixed Monthly Charge: $10.00

Total Cost: $14.50

4D) Simulate a calculator using switch case.

```
#include <stdio.h>

int main()
{
	char Operator;
	float num1, num2, result = 0;

	printf("\n Please Enter an Operator (+, -, *, /)  :  ");
	scanf("%c", &Operator);

	printf("\n Please Enter the Values for two Operands: num1 and num2  :  ");
	scanf("%f%f", &num1, &num2);

	switch(Operator)
	{
		case '+':
			result = num1 + num2;
			break;
		case '-':
			result = num1 - num2;
			break;
		case '*':
			result = num1 * num2;
			break;
		case '/':
			result = num1 / num2;
			break;
		default:
			printf("\n You have enetered an Invalid Operator ");

	}

	printf("\n The result of %.2f %c %.2f  = %.2f", num1, Operator, num2,
result);
```

```
        return 0;
}
```

ExpectedOutput1:-

Simple Calculator

Enter the first number: 56

Enter an operator (+, -, *, /): *

Enter the second number: 45

Result: 56.00 * 45.00 = 2520.00.

ExpectedOutput2:-

Simple Calculator

Enter the first number: 34

Enter an operator (+, -, *, /): /

Enter the second number: 24

Result: 34.00 / 24.00 = 1.42

4E) Find the given year is a leap year or not.

```
#include <stdio.h>

int main()
{
   int year;

   printf("Enter a year: ");
   scanf("%d", &year);

   if ((year % 4 == 0 && year % 100 != 0) || (year % 400 == 0))
   {
      printf("%d is a leap year.\n", year);
   }
  else
   {
      printf("%d is not a leap year.\n", year);
   }

   return 0;
}
```

ExpectedOutput1:-

Enter a year: 2024

2024 is a leap year.

ExpectedOutput2:-

Enter a year: 2034

2034 is not a leap year.

Week 5:

Program:-

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

int main() {
    int a, b;
    scanf("%d\n%d", &a, &b);

    for (int i = a; i <= b; i++) {
        if (i == 1) {
            printf("one\n");
        } else if (i == 2) {
            printf("two\n");
        } else if (i == 3) {
            printf("three\n");
        } else if (i == 4) {
            printf("four\n");
        } else if (i == 5) {
```

```
            printf("five\n");
        } else if (i == 6) {
            printf("six\n");
        } else if (i == 7) {
            printf("seven\n");
        } else if (i == 8) {
            printf("eight\n");
        } else if (i == 9) {
            printf("nine\n");
        } else if (i % 2 == 0) {
            printf("even\n");
        } else {
            printf("odd\n");
        }
    }

    return 0;
}
```

Expected Output1:-

8 11

eight

nine

even

odd

5B) Given a five digit integer, print the sum of its digits.

```
#include<stdio.h>
int main()
{
    int n,i,temp,sum=0;
    scanf("%d", &n);
```

```
    for(i=1;i<=5;i++)
      {
        if((n>=10000)||(n<=99999))
         {
            temp=n%10;
            sum=sum+temp;
             n=n/10 ;
         }
      }
   printf("%d",sum);
}
```

Output:

```
10564
16
```

5C) Given number is a prime or not. (Also Prime numbers between a given range)

```
#include <stdio.h>
int main()
{
    int n, i, flag = 0;
    printf("Enter a positive integer: ");
    scanf("%d", &n);

  // 0 and 1 are not prime numbers
  // change flag to 1 for non-prime number
  if (n == 0 || n == 1)
    flag = 1;

  for (i = 2; i <= n / 2; ++i) {

    // if n is divisible by i, then n is not prime
    // change flag to 1 for non-prime number
    if (n % i == 0) {
      flag = 1;
      break;
```

```
    }
  }

  // flag is 0 for prime numbers
  if (flag == 0)
    printf("%d is a prime number.", n);
  else
    printf("%d is not a prime number.", n);
  return 0;
}
```

OUTPUT:

Enter a positive integer: 47
47 is a prime number.

5d. Armstrong number or not

```
#include<stdio.h>
#include<math.h>
 int main()
{
int i,n,r,sum=0,temp;
printf("enter the number=");
scanf("%d",&n);
temp=n;
for (temp = n; temp != 0; ++i)
   {
      temp /= 10;
   }
for (temp = n; temp != 0;temp /= 10 )
  {
     r=temp%10;
     sum=sum+pow(r,i);
  }
if(sum==n)
```

```
printf("%d is armstrong  number ",n);
else
printf("not armstrong number");
return 0;
}
```

OUTPUT :

enter the number=534494836

534494836 is armstrong number

5e.Palindrome or not

```
#include <stdio.h>
  int main()
{
   int n, reversed = 0, remainder, original;
   printf("Enter an integer: ");
   scanf("%d", &n);
   original = n;

   // reversed integer is stored in reversed variable
   while (n != 0) {
      remainder = n % 10;
      reversed = reversed * 10 + remainder;
      n /= 10;
   }

   // palindrome if orignal and reversed are equal
   if (original == reversed)
      printf("%d is a palindrome.", original);
   else
      printf("%d is not a palindrome.", original);

   return 0;
}
```

OUTPUT:

Enter an integer: 1331
1331 is a palindrome.

5f. Printing patterns in loops.hacker rank.

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

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

int main() {
   int n;
   scanf("%d", &n);

   int len = 2*n - 1;
   for (int i = 0; i < len; i++) {
      for (int j = 0; j < len; j++) {
         int min = i < j ? i : j;
         min = min < len-i ? min : len-i-1;
         min = min < len-j-1 ? min : len-j-1;
         printf("%d ", n-min);
      }
      printf("\n");
   }

   return 0;
}
```

Input (stdin)

2

Expected Output1:-

2 2 2
2 1 2
2 2 2

Input (stdin)

5

Expected Output2:-

5 5 5 5 5 5 5 5 5
5 4 4 4 4 4 4 4 5
5 4 3 3 3 3 3 4 5
5 4 3 2 2 2 3 4 5
5 4 3 2 1 2 3 4 5
5 4 3 2 2 2 3 4 5
5 4 3 3 3 3 3 4 5
5 4 4 4 4 4 4 4 5
5 5 5 5 5 5 5 5 5

5G) Printing patterns in loops

Program:-

```
#include <stdio.h>
int main() {
    int rows, spaces, stars,i;
    printf("Enter the number of rows: ");
    scanf("%d", &rows);

    for (i = 1; i <= rows; i++) {
        // Print spaces
        for (spaces = 1; spaces <= rows - i; spaces++) {
            printf(" ");
        }

        // Print stars
        for (stars = 1; stars <= 2 * i - 1; stars++) {
            printf("*");
        }
        printf("\n");
    }

    return 0;
}
```

Expected Output1:-

Enter the number of rows: 5

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