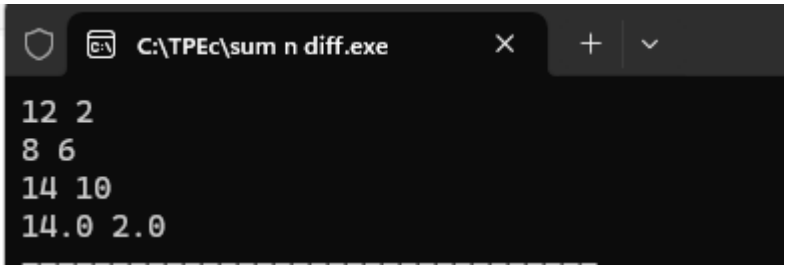
Module-1

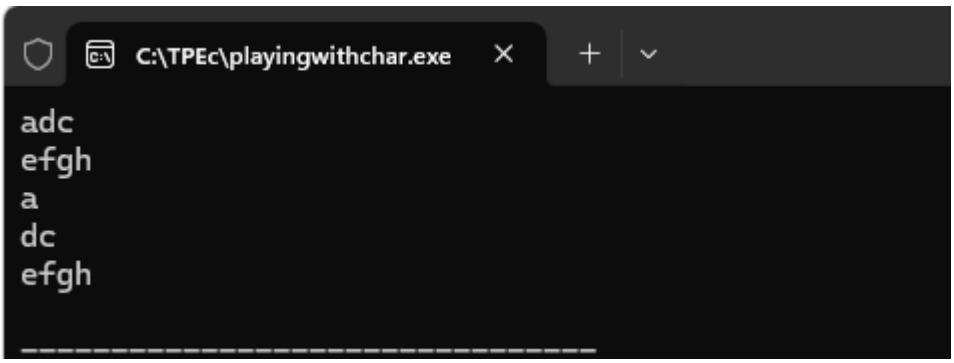
1. Sum and difference of two numbers

```
#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);
   int int_sum = a+b;
   int int_diff = a-b;
   float float_sum = c+d;
   float float_diff = c-d;
   printf("%d %d\n",int_sum,int_diff);
   printf("%0.1f %0.1f", float_sum,float_diff);
   return 0;

}
```



2. Playing with characters

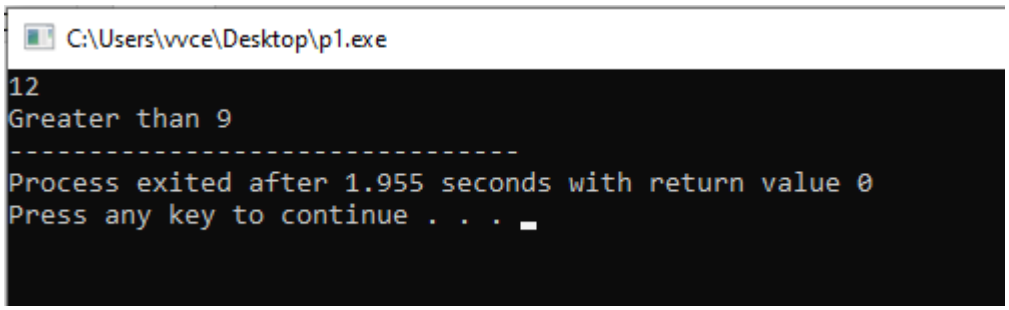
```
#include <stdio.h>
#include <string.h>
#include <math.h>
#include <stdlib.h>
int main()
{
   char ch;
   char s[24];
   char t[100];
    scanf("%c", &ch);
   scanf("%s", s);
   getchar();
   scanf("%[^\n]%*c", t);
    printf("%c\n", ch);
   printf("%s\n", s);
   printf("%s\n", t);
       return 0;
}
```



3.Conditional statements in C

```
#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); }
if (n==1){
printf("one");
}
else if(n==2){
printf("two");
}
else if(n==3){
printf("three");
}
else if(n==4){
printf("four");
}
else if(n==5){
printf("five");
}
else if(n==6){
printf("six");
}
else if(n==7){
printf("seven");
}
else if(n==8){
printf("eight");
}
```

```
else if(n==9){
printf("nine");
}
else if(n>9){
printf("Greater than 9");
}
return 0;
}
char* readline() {
size_t alloc_length = 1024;
size_t data_length = 0;
char data[1024];
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;
if (!data) { break; }
alloc_length = new_length;
}
if (data[data_length - 1] == '\n') {
data[data_length - 1] = '\0';
}
return data;
}
```

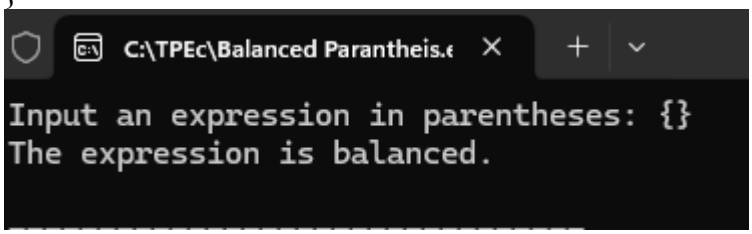


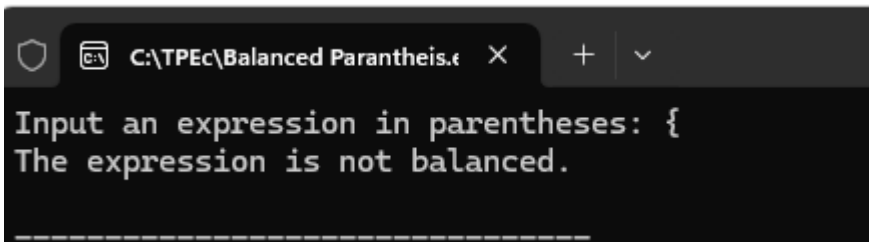
4. Valid Paranthesis

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#define MAX_SIZE 100
// Global variables for stack and top
char stack[MAX_SIZE];
int top = -1;
// Function to push a character onto the stack
void push(char data) {
    if (top == MAX_SIZE - 1) {
        printf("Overflow stack!\n");
```

```
        return;
    }
    top++;
    stack[top] = data;
}
// Function to pop a character from the stack
char pop() {
    if (top == -1) {
        printf("Empty stack!\n");
        return ' ';
    }
    char data = stack[top];
    top--;
    return data;
}

// Function to check if two characters form a matching pair of parentheses
int is_matching_pair(char char1, char char2) {
    if (char1 == '(' && char2 == ')') {
        return 1;
    } else if (char1 == '[' && char2 == ']') {
        return 1;
    } else if (char1 == '{' && char2 == '}') {
        return 1;
    } else {
        return 0;
    }
}
// Function to check if the expression is balanced
int isBalanced(char* text) {
    int i;
    for (i = 0; i < strlen(text); i++) {
        if (text[i] == '(' || text[i] == '[' || text[i] == '{') {
            push(text[i]);
        } else if (text[i] == ')' || text[i] == ']' || text[i] == '}') {
            if (top == -1) {
                return 0; // If no opening bracket is present
            } else if (!is_matching_pair(pop(), text[i])) {
                return 0; // If closing bracket doesn't match the last opening bracket
            }
        }
    }
    if (top == -1) {
        return 1; // If the stack is empty, the expression is balanced
    } else {
        return 0; // If the stack is not empty, the expression is not balanced
    }
}
// Main function
int main() {
   char text[MAX_SIZE];
   printf("Input an expression in parentheses: ");
```

```
  scanf("%s", text);

  // Check if the expression is balanced or not
  if (isBalanced(text)) {
     printf("The expression is balanced.\n");
  } else {
     printf("The expression is not balanced.\n");
  }
  return 0;
}
```

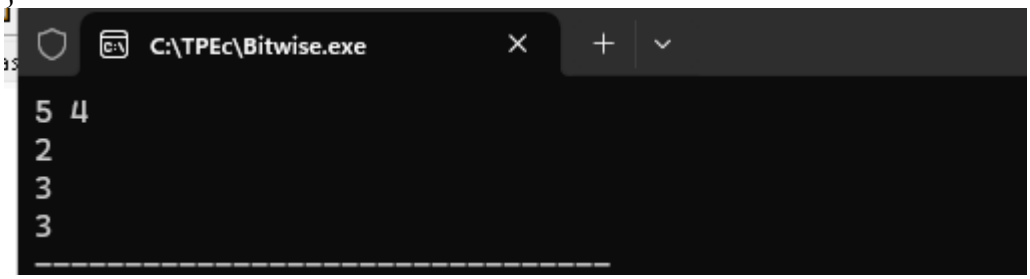




5. Bitwise Operators

```
#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;
}
```

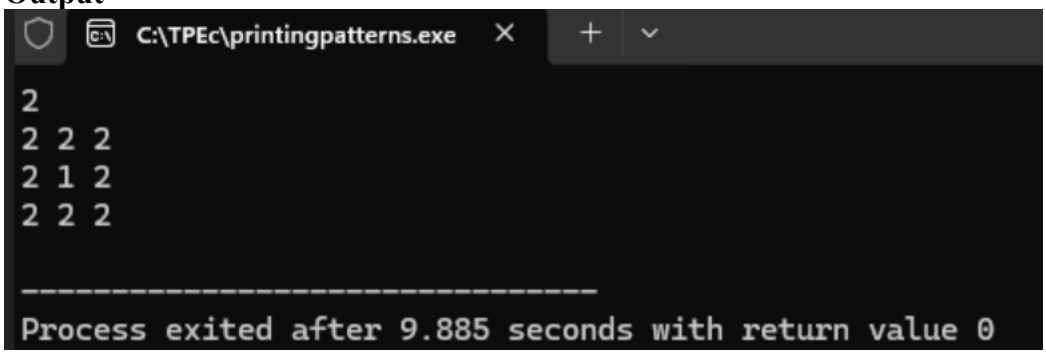


MODULE -2

1. Printing Patterns Using Loops

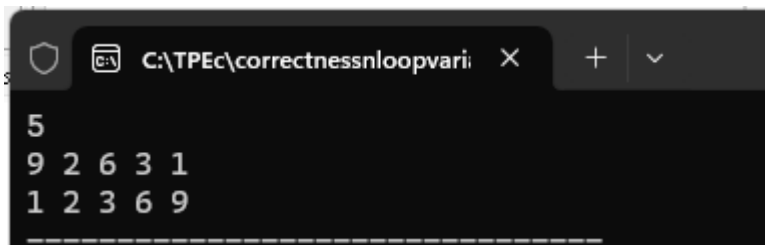
```
#include <stdio.h>
#include <string.h>
#include <math.h>
#include <stdlib.h>

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;
}
```

Output



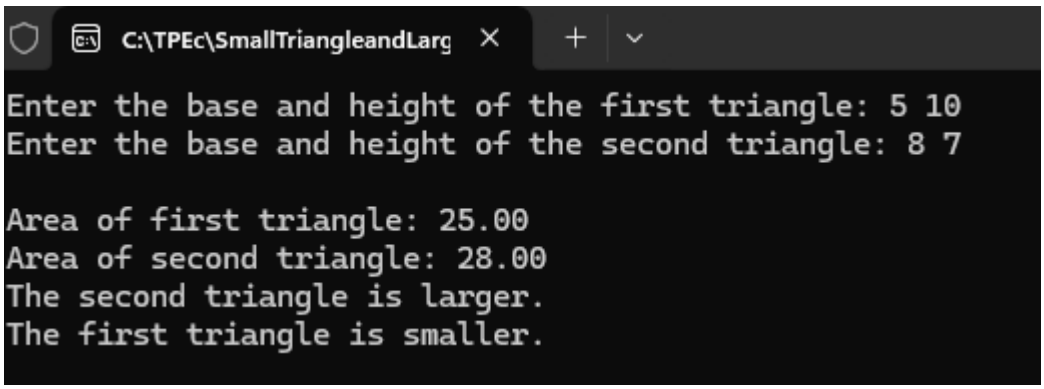
2. Correctness and Loop Variant

```
#include <stdio.h>
#include <string.h>
#include <math.h>
#include <stdlib.h>
#include <assert.h>
 void insertionSort(int N, int arr[]) {
    int i,j;
    int value;
    for(i=1;i<N;i++)
    {
        value=arr[i];
        j=i-1;
        while(j>=0 && value<arr[j])
        {
            arr[j+1]=arr[j];
            j=j-1;
            }
        arr[j+1]=value;
    }
    for(j=0;j<N;j++)
    {
        printf("%d",arr[j]);
        printf(" ");
    }
}

int main(void) {

    int N;
    scanf("%d", &N);
    int arr[N], i;
    for(i = 0; i < N; i++) {
        scanf("%d", &arr[i]);
    }
    insertionSort(N, arr);

    return 0;
}
```



3. Small And Large Triangle

```
#include <stdio.h>
// Function to calculate the area of a triangle
float calculateArea(float base, float height) {
   return (0.5 * base * height);
}
int main() {
   float base1, height1, base2, height2, area1, area2;
   // Input for the first triangle
   printf("Enter the base and height of the first triangle: ");
   scanf("%f %f", &base1, &height1);
   // Input for the second triangle
   printf("Enter the base and height of the second triangle: ");
   scanf("%f %f", &base2, &height2);
   // Calculate the areas of both triangles
   area1 = calculateArea(base1, height1);
   area2 = calculateArea(base2, height2);
   // Compare the areas and determine which triangle is larger
   printf("\nArea of first triangle: %.2f", area1);
   printf("\nArea of second triangle: %.2f", area2);
   if (area1 > area2) {
      printf("\nThe first triangle is larger.\n");
      printf("The second triangle is smaller.\n");
   } else if (area1 < area2) {
      printf("\nThe second triangle is larger.\n");
      printf("The first triangle is smaller.\n");
   } else {
      printf("\nBoth triangles have the same area.\n");
   }
   return 0;
}
```



4. Happy Numbers

```
#include<stdio.h>
int main()
{
   int num,sum=0;
   printf("Enter the number");
   scanf("%d",&num);
```

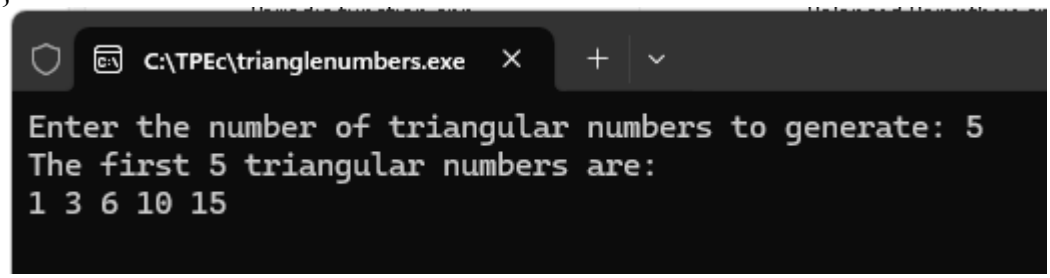
```
    while((num!=1)&& (num!=4)){
        while(num>0){
            sum=sum+((num%10)*(num%10));
            num=num/10;
        }
        num=sum;
        sum=0;
    }
    if(num==1){
        printf("Happy Number");
    }
    else{
        printf("not Happy Number");
    }
    return 0;
}
```

```
Enter the number 12
not Happy Number
--------------------------------
Process exited after 1.98 seconds with return value 0
Press any key to continue . . .
```

5. Triangle Numbers

```
#include <stdio.h>
// Function to calculate the nth triangular number
int triangularNumber(int n) {
    return (n * (n + 1)) / 2;
}
int main() {
    int n, i;

    // Input for how many triangular numbers to generate
    printf("Enter the number of triangular numbers to generate: ");
    scanf("%d", &n);

    // Generate and display the first n triangular numbers
    printf("The first %d triangular numbers are:\n", n);
    for (i = 1; i <= n; i++) {
        printf("%d ", triangularNumber(i));
```

```
    }
    printf("\n");

    return 0;
}
```

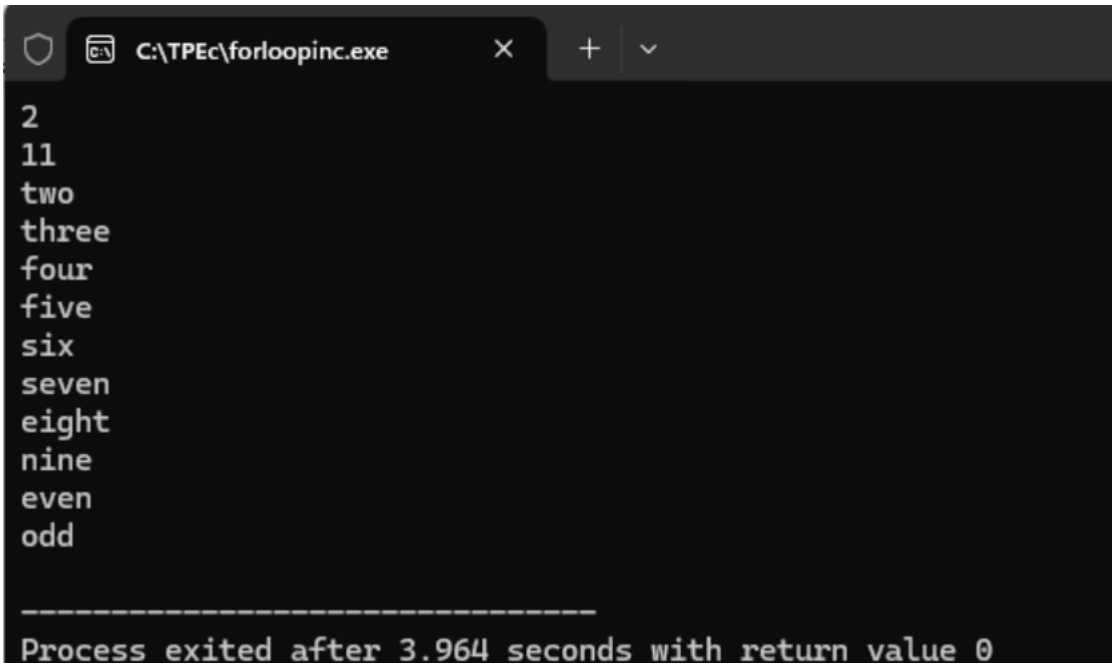


MODULE-3

1. **For loop in C**

```
#include <stdio.h>
#include <string.h>
#include <math.h>
#include <stdlib.h>
int main()
{
   int a, b,i;
   scanf("%d\n%d", &a, &b);
  // Complete the code.
   for(i=a;i<=b;i++)
     {
       if(i<10)
                 {
          if(i==1)
          printf("one\n");
```

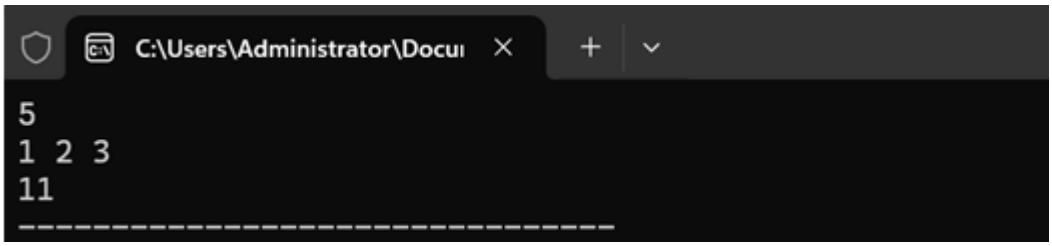
```
            else if(i==2)
            printf("two\n");
            else if(i==3)
            printf("three\n");
            else if(i==4)
            printf("four\n");
            else if(i==5)
            printf("five\n");
            else if(i==6)
            printf("six\n");
            else if(i==7)
            printf("seven\n");
            else if(i==8)
            printf("eight\n");
            else if(i==9)
            printf("nine\n");
        }
        else {
            if(i%2==1)
            printf("odd\n");
            else {
            printf("even\n");
            }
                }
    }
        return 0;
}
```



2. Calculate Nth term

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

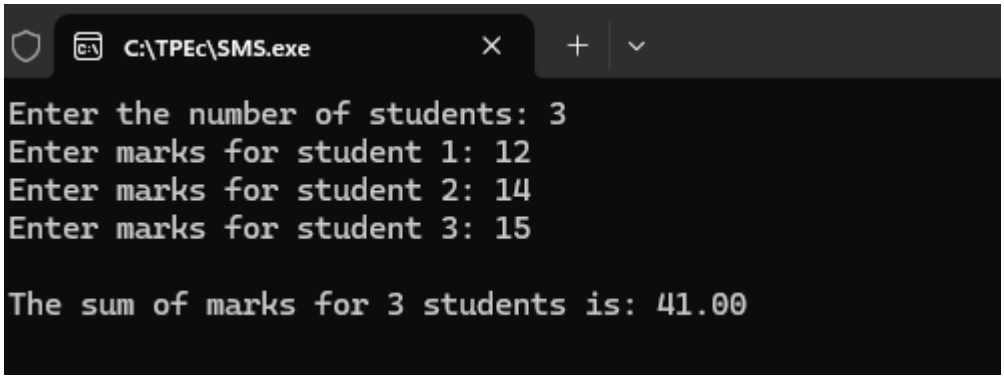
```
#include<stdlib.h>
//Complete the following function.
int find_nth_term(int n, int a, int b, int c) {
 //Write your code here.
int term, t1 = a, t2 = b, t3 = c;
  if (n == 1)
    term = t1;
  else if (n == 2)
    term = t2;
  else if (n == 3)
    term = t3;
  else {
    for (int i = 4; i <= n; i++) {
      term = t1 + t2 + t3;
      t1 = t2;
      t2 = t3;
      t3 = term;
    }
  }
  return term;
}
int main() {
  int n, a, b, c;
  scanf("%d %d %d %d", Cn, Ca, Cb, Cc);
  int ans = find_nth_term(n, a, b, c);
  print("%d", ans);
  return 0;
}
```



3. Student Marks Sum

```
#include<stdio.h>
 int main() {
  int n, i;
  float marks, sum = 0;

  // Input the number of students
  printf("Enter the number of students: ");
  scanf("%d", &n);

  // Input the marks for each student and calculate the sum
  for (i = 1; i <= n; i++) {
```

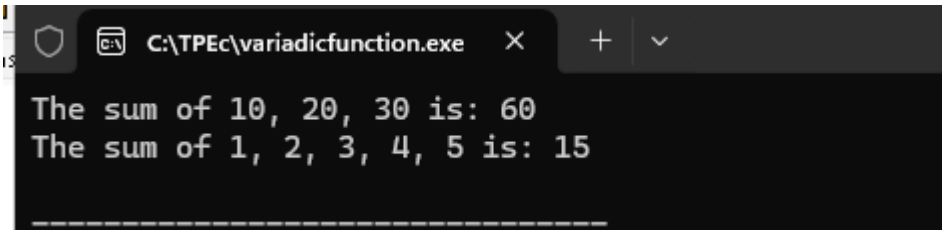
```
        printf("Enter marks for student %d: ", i);
        scanf("%f", &marks);
        sum += marks;
    }
    // Display the total sum of marks
    printf("\nThe sum of marks for %d students is: %.2f\n", n, sum);
    return 0;
}
```



4. Variadic Functions

```
#include <stdio.h>
#include <stdarg.h>
// Variadic function to calculate the sum of given integers
int sum(int count, ...) {
    va_list args;
    int total = 0;
    int i;

    // Initialize the argument list
    va_start(args, count);

    // Loop through all the arguments
    for (i = 0; i < count; i++) {
        total += va_arg(args, int); // Retrieve the next argument
    }

    // Clean up the argument list
    va_end(args);

    return total;
}
int main() {
    // Example usage of the sum function
```

```
    int result1 = sum(3, 10, 20, 30);  // Sum of 3 numbers: 10, 20, 30
    int result2 = sum(5, 1, 2, 3, 4, 5); // Sum of 5 numbers: 1, 2, 3, 4, 5
    // Display the results
    printf("The sum of 10, 20, 30 is: %d\n", result1);
    printf("The sum of 1, 2, 3, 4, 5 is: %d\n", result2);
    return 0;
}
```



5. Nth Tribonacci Numbers

```
#include <stdio.h>
// Function to calculate the Nth Tribonacci number
int tribonacci(int n) {
    if (n == 0) return 0;
    if (n == 1 || n == 2) return 1;
    int a = 0, b = 1, c = 1, next;
    for (int i = 3; i <= n; i++) {
        next = a + b + c; // Calculate the next term
        a = b; // Update a to the next term
        b = c; // Update b to the next term
        c = next; // Update c to the next term
    }

    return c;
}
int main() {
    int n;
    // Input the value of N
    printf("Enter the value of N: ");
    scanf("%d", &n);
    // Calculate and display the Nth Tribonacci number
    printf("The %dth Tribonacci number is: %d\n", n, tribonacci(n));
    return 0;
}
```