

Practical-1

Aim: Setup VS Code + GCC, write the first C program, explain the structure, Print name & age using printf

Steps to install and set up the Compiler are:

1. Go to any browser and download the exe file of Mingw.
2. The path for installation should be C:\mingw
3. Click install
4. Make sure to mark gcc compiler and the basic MinGW setup for installation
5. Click on Apply Changes

Add compiler path

1. Open the edit system environment variables
2. Select the path, click edit
3. Click on new and enter this path C:\mingw\bin
4. Select ok to apply the changes
5. Run gcc --version to verify the compiler path is set correctly.

Install VS Code

1. Go to any browser and download the exe file of VS Code
2. Click I accept the agreement
3. Put VS Code for installation by Microsoft

Set up VS Code

1. Download C / C++ extension pack by Microsoft.

2. Download Code Runner extension.
3. Open settings, select run in terminal.

Steps to write the first code

1. Create a folder and open it in VS Code
2. Create a new file, myinfo.c
3. Write code

Code and output:

The screenshot shows the Visual Studio Code interface. The left sidebar has icons for file operations like New, Open, Save, and Close. The main editor area displays a C program named 'prac1.c'. The code is as follows:

```
#include<stdio.h>
int main(){
    printf("ayushi lodhi\n");
    printf("im 18");
    return 0;
}
```

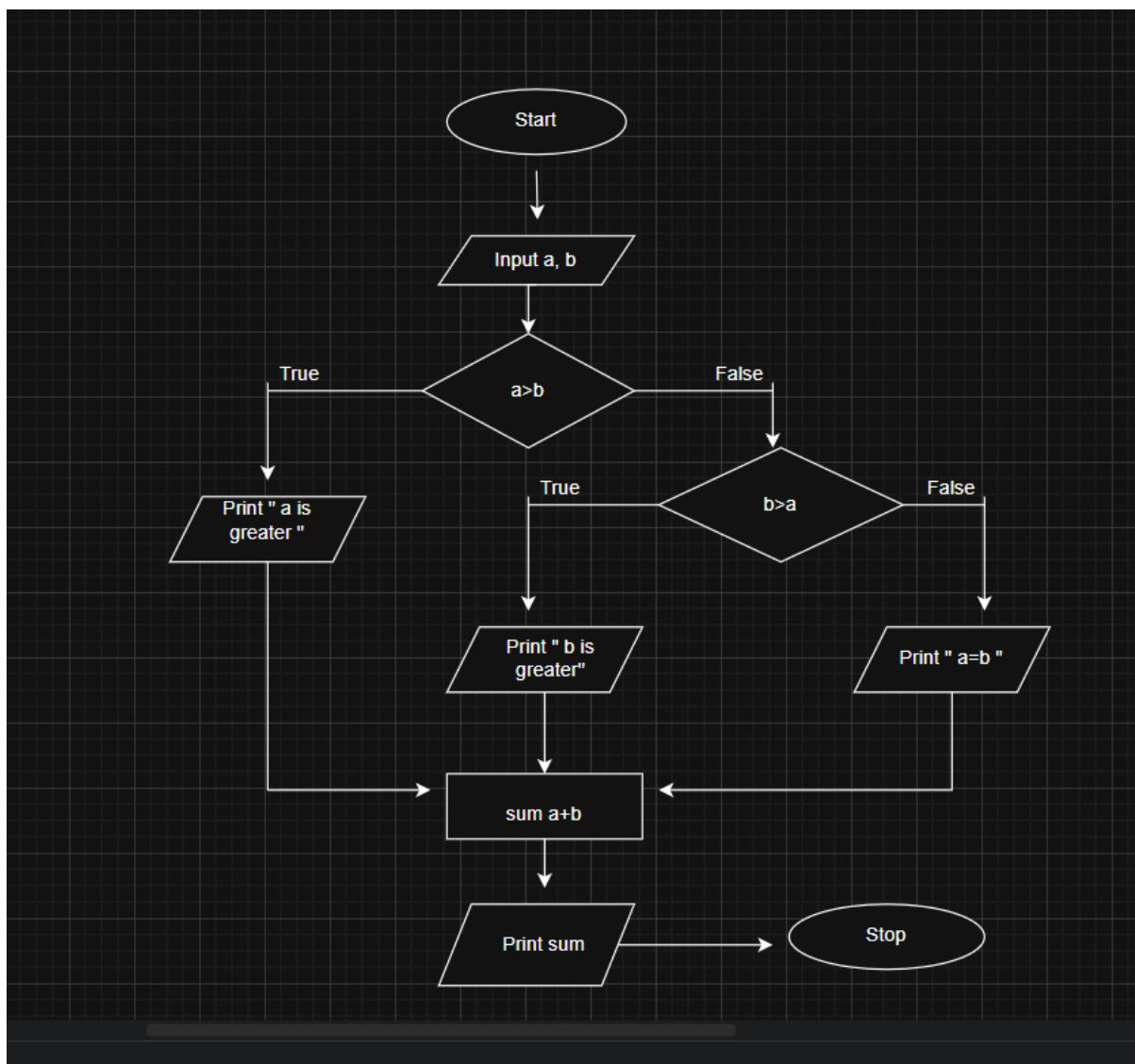
Below the editor, the terminal tab is active, showing the command line history and the execution of the program. The terminal output is:

```
cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac1.c -o prac1 && "/Users/ayushilodhi/Documents/c:c++/" && cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac1.c -o prac1 && "/Users/ayushilodhi/Documents/c:c++/" && ./prac1
ayushi lodhi
im 18
ayushilodhi@Ayushis-MacBook-Air c:c++ %
```

Practical-2

Aim: Draw flowcharts for sum & largest of two numbers, implement in C, and show VS Code shortcuts.

Flowchart for showing the largest of two numbers and their sum:



Algorithm:

Step 1: Start

Step 2: Input two numbers a and b

Step 3: Compute sum = a + b

Step 4: Check if a == b

If true, then

► Display "Both numbers are equal"

Else

► If a > b then

→ largest = a

→ Display "Largest = a"

► Else

→ largest = b

→ Display "Largest = b"

Step 5: Display sum

Step 6: Stop

VS code shortcuts:

Keyboard Shortcuts for VS CODE



CTRL + N	New file	CTRL + F4	Close
CTRL + O	Open file	F9	Toggle breakpoint
CTRL + S	Save	F10	Step over
CTRL + T	Show all symbols	F5	Start/Continue
CTRL + G	Go to line	ALT + Z	Toggle word wrap
CTRL + P	Go to file	F8	Go to the next error
CTRL + F	Find	SHIFT + F8	Go to the previous error
CTRL + H	Replace	ALT + Click	Insert cursor
CTRL + I	Select current line	CTRL + V	Paste
CTRL + \	Split editor	CTRL + C	Copy

Practical-3

Aim: Use of various data types along with format specifiers and swapping of two numbers.

Code:

```
... C prac1.c C prac2.c X
C prac2.c > main()
1 #include <stdio.h>
2
3 int main() {
4     int a, b, temp;
5     float x;
6     char ch;
7     double d;
8
9     // Input values
10    printf("Enter two integers:\n");
11    scanf("%d %d", &a, &b);
12
13    printf("Enter a float value: ");
14    scanf("%f", &x);
15
16    printf("Enter a character: ");
17    scanf(" %c", &ch);
18
19    printf("Enter a double value: ");
20    scanf("%lf", &d);
21
22    // Display values using format specifiers
23    printf("\nValues before swapping:\n");
24    printf("a = %d, b = %d\n", a, b);
25    printf("Float value = %f\n", x);
26    printf("Character = %c\n", ch);
27    printf("Double value = %lf\n", d);
28
29    // Swapping logic
30    temp = a;
31    a = b;
32    b = temp;
33
34    printf("\nValues after swapping:\n");
35    printf("a = %d, b = %d\n", a, b);
36
37    return 0;
38 }
39
```

Output:

```
● ayushilodhi@Ayushis-MacBook-Air c:c++ % cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac2.c -o prac2 && "/Users/ayushilodhi/Documents/c:c++/"prac2
Enter two integers:
5 10
Enter a float value: 3.5
Enter a character: c
Enter a double value: 8.9

Values before swapping:
a = 5, b = 10
Float value = 3.500000
Character = c
Double value = 8.900000

Values after swapping:
a = 10, b = 5
ayushilodhi@Ayushis-MacBook-Air c:c++ %
```

Practical-4

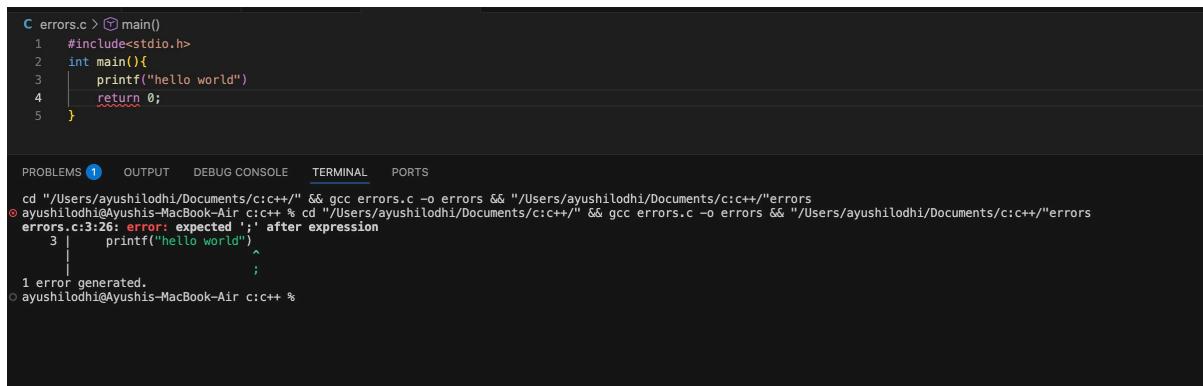
Aim: Explanation of compile-time and run-time errors.

- 1) **Compile-time errors:** A compile-time error happens when you write incorrect code that the compiler cannot translate into an executable program. These errors are detected before the program runs, during the compilation stage.

Types of compile-time errors:

- **Syntax Errors:** A syntax error occurs when a statement in a C program violates the grammatical or structural rules of the language, preventing successful compilation.

Example:



The screenshot shows a terminal window with the following content:

```
C errors.c > main()
1 #include<stdio.h>
2 int main(){
3     printf("hello world")
4     return 0;
5 }

PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL PORTS
cd "/Users/ayushilodhi/Documents/c:c++/" && gcc errors.c -o errors && "/Users/ayushilodhi/Documents/c:c++/"errors
ayushilodhi@Ayushis-MacBook-Air c:c++ % cd "/Users/ayushilodhi/Documents/c:c++/" && gcc errors.c -o errors && "/Users/ayushilodhi/Documents/c:c++/"errors
errors.c:3:26: error: expected ';' after expression
   3 |     printf("hello world")
      |                         ^
      |
1 error generated.
ayushilodhi@Ayushis-MacBook-Air c:c++ %
```

- **Undeclared Variable Errors:** These occur when a variable is used in a program before it has been declared or defined.

Example:

The screenshot shows a code editor interface with multiple tabs open. The active tab contains the following C code:

```

C prac1.c      C prac2.c      C prac6.c      C errors.c 1 X
C errors.c > ↗ main()
1   #include<stdio.h>
2   int main(){[
3     printf("%d",&num);
4   }
5 }

```

Below the code, the terminal window shows the output of a compilation command:

```

PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL PORTS
cd "/Users/ayushilodhi/Documents/c:c++/" && gcc errors.c -o errors && "/Users/ayushilodhi/Documents/c:c++/"errors
ayushilodhi@Ayushis-MacBook-Air c:c++ % cd "/Users/ayushilodhi/Documents/c:c++/" && gcc errors.c -o errors && "/Users/ayushilodhi/Documents/c:c++/"errors
errors.c:3:18: error: use of undeclared identifier 'num'
      3 |     printf("%d",&num);
           ^
1 error generated.
ayushilodhi@Ayushis-MacBook-Air c:c++ %

```

- **Type Mismatch Errors:** These occur when an operation or assignment involves incompatible data types, such as assigning a value of one type to a variable of another type.

Example:

The screenshot shows a code editor interface with multiple tabs open. The active tab contains the following C code:

```

C prac1.c      C prac2.c      C prac6.c      C errors.c 1 X
C errors.c > ↗ main()
1   #include<stdio.h>
2   int main(){[
3     int a;
4     a=hello;
5   }
6 }

```

Below the code, the terminal window shows the output of a compilation command:

```

PROBLEMS 1 OUTPUT DEBUG CONSOLE TERMINAL PORTS
cd "/Users/ayushilodhi/Documents/c:c++/" && gcc errors.c -o errors && "/Users/ayushilodhi/Documents/c:c++/"errors
ayushilodhi@Ayushis-MacBook-Air c:c++ % cd "/Users/ayushilodhi/Documents/c:c++/" && gcc errors.c -o errors && "/Users/ayushilodhi/Documents/c:c++/"errors
errors.c:4:7: error: use of undeclared identifier 'hello'; did you mean 'ftello'?
  4 |     a=hello;
        ^
          ^tello
/Library/Developer/CommandLineTools/SDKs/MacOSX.sdk/usr/include/_stdio.h:429:8: note: 'ftello' declared here
429 | off_t ftello(FILE * __stream);
          ^
1 error generated.
ayushilodhi@Ayushis-MacBook-Air c:c++ %

```

- **Missing Header File Errors:** These occur when a program uses library functions without including the appropriate header file required for their declarations.

Example:

The screenshot shows a terminal window with the following content:

```
prac1.c   prac2.c   prac6.c   errors.c  X
errors.c > ...
1
2     int main(){
3         printf("hello");
4     return 0;
5 }

PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
cd "/Users/ayushilodhi/Documents/c:c++/" && gcc errors.c -o errors && "/Users/ayushilodhi/Documents/c:c++/"errors
ayushilodhi@ayushis-MacBook-Air:~/Documents/c:c++% cd "/Users/ayushilodhi/Documents/c:c++/" && gcc errors.c -o errors && "/Users/ayushilodhi/Documents/c:c++/"errors
errors.c:3:5: error: call to undeclared library function 'printf' with type 'int (const char *, ...)' ISO C99 and later do not support implicit function declarations [-Wimplicit-function-declaration]
3 |     printf("hello");
errors.c:3:5: note: include the header <stdio.h> or explicitly provide a declaration for 'printf'
1 error generated.
ayushilodhi@ayushis-MacBook-Air:~/Documents/c:c++%
```

- **Redeclaration Error:** This compile-time error occurs when a variable or function is declared more than once with the same name in the same scope, causing a conflict for the compiler.

Example:

The screenshot shows a terminal window with the following content:

```
prac1.c   prac2.c   prac6.c   errors.c  1
errors.c > main()
1
2     int main(){
3         int a=20;
4         int a=5;
5         printf("%d",a);
6     return 0;
7 }

PROBLEMS 1  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS
cd "/Users/ayushilodhi/Documents/c:c++/" && gcc errors.c -o errors && "/Users/ayushilodhi/Documents/c:c++/"errors
ayushilodhi@ayushis-MacBook-Air:~/Documents/c:c++% cd "/Users/ayushilodhi/Documents/c:c++/" && gcc errors.c -o errors && "/Users/ayushilodhi/Documents/c:c++/"errors
errors.c:3:10: error: expected ';' at end of declaration
3 |     int a=20;
|               ^
errors.c:4:9: error: redefinition of 'a'
4 |     int a=5;
|               ^
errors.c:3:9: note: previous definition is here
3 |     int a=20;
|               ^
2 errors generated.
ayushilodhi@ayushis-MacBook-Air:~/Documents/c:c++%
```

- 2) **Run-time Errors:** These occur while a program is running, after successful compilation, and cause abnormal termination or incorrect results. They happen due to invalid operations such as division by zero, invalid memory access, or file input/output failures.

Types of run-time errors:

- Divide by Zero

Example:

A screenshot of a terminal window within a code editor interface. The terminal tab is active, showing the following command and its output:

```
cd "/Users/ayushilodhi/Documents/c:c++/" && gcc errors.c -o errors && "/Users/ayushilodhi/Documents/c:c++/"errors
ayushilodhi@Ayushis-MacBook-Air c:c++ % cd "/Users/ayushilodhi/Documents/c:c++/" && gcc errors.c -o errors && "/Users/ayushilodhi/Documents/c:c++/"errors
ayushilodhi@Ayushis-MacBook-Air c:c++ %
```

The output shows a segmentation fault (SIGSEGV) at address 0x0.

- **Segmentation Fault:** A segmentation fault occurs when a program tries to access memory that it is not authorized to use, such as dereferencing a null or invalid pointer or accessing an array element outside its valid range.

Example:

A screenshot of a terminal window within a code editor interface. The terminal tab is active, showing the following command and its output:

```
cd "/Users/ayushilodhi/Documents/c:c++/" && gcc errors.c -o errors && "/Users/ayushilodhi/Documents/c:c++/"errors
ayushilodhi@Ayushis-MacBook-Air c:c++ % cd "/Users/ayushilodhi/Documents/c:c++/" && gcc errors.c -o errors && "/Users/ayushilodhi/Documents/c:c++/"errors
errors.c:5:16: warning: format specifies type 'int *' but the argument has type 'int' [-Wformat]
  5 |   scanf("%d",a);
               ^
1 warning generated.
enter a number
```

The output shows a segmentation fault (SIGSEGV) at address 0x0.

- **Infinite Loop:** An infinite loop is a loop that never terminates because its condition always remains true, causing the program to execute repeatedly without end.

Example:

The screenshot shows a terminal window with multiple tabs open. The active tab displays a C program named 'errors.c' with the following code:

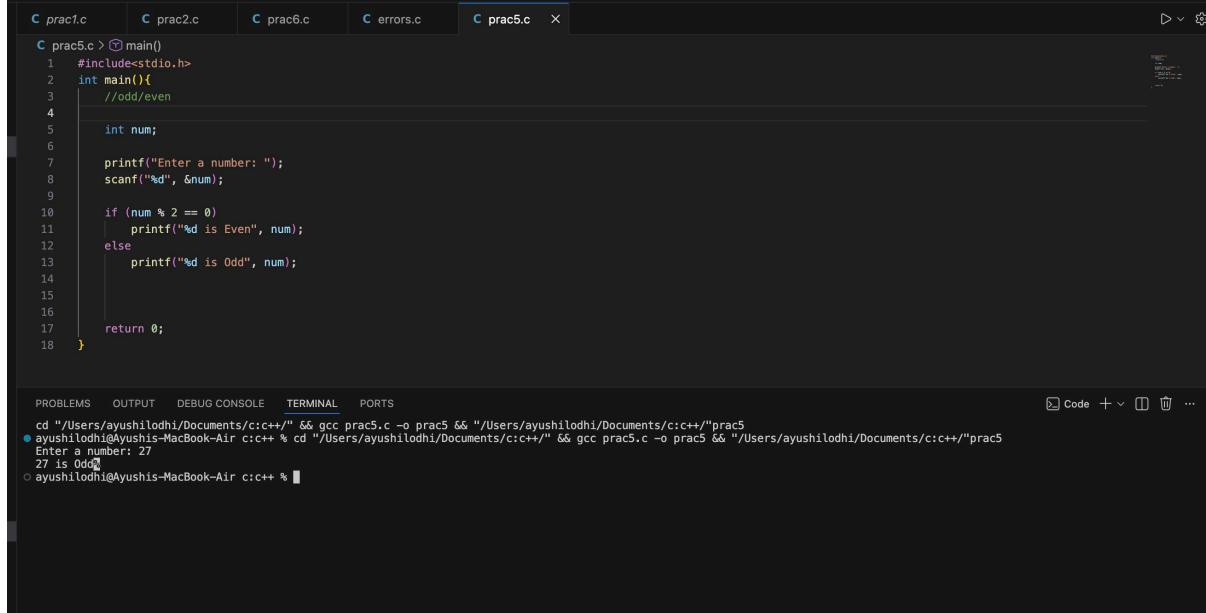
```
C errors.c > main()
1 #include<stdio.h>
2 int main(){
3     int a=1;
4     while(a<5){
5         printf("Hello, world!");
6         //Infinite loop
7     }
}
```

The terminal output shows the program running in an infinite loop, printing "Hello, world!" repeatedly. The scroll bar at the bottom indicates that the output has been truncated.

Practical-5

Aim: Odd/Even check using if-else, maximum of three numbers, ternary operator, and switch case.

1. If-Else (Definition): The if-else statement is a decision-making control structure that allows a program to execute one block of code if a condition is true, and another block if the condition is false.



The screenshot shows a code editor with multiple tabs open, but the active tab is 'prac5.c'. The code in 'prac5.c' is as follows:

```
prac5.c > main()
1 #include<stdio.h>
2 int main(){
3     //odd/even
4
5     int num;
6
7     printf("Enter a number: ");
8     scanf("%d", &num);
9
10    if (num % 2 == 0)
11        printf("%d is Even", num);
12    else
13        printf("%d is Odd", num);
14
15
16    return 0;
17 }
```

Below the code editor is a terminal window showing the execution of the program:

```
cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac5.c -o prac5 && "/Users/ayushilodhi/Documents/c:c++/"prac5
ayushilodhi@Ayushis-MacBook-Air c:c++ % cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac5.c -o prac5 && "/Users/ayushilodhi/Documents/c:c++/"prac5
Enter a number: 27
27 is odd
ayushilodhi@Ayushis-MacBook-Air c:c++ %
```

- Program to check if a number is even or odd using an if-else statement.

- Program to check the maximum of three numbers using an if-else statement.

```

C prac5.c > main()
14 //min max
15
16 int a, b, c;
17
18 printf("Enter three numbers: ");
19 scanf("%d %d %d", &a, &b, &c);
20
21 if (a > b && a > c)
22     printf("Maximum number = %d", a);
23 else if (b > c)
24     printf("Maximum number = %d", b);
25 else
26     printf("Maximum number = %d", c);
27
28
29
30
31     return 0;
32 }

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac5.c -o prac5 && "/Users/ayushilodhi/Documents/c:c++/"prac5
ayushilodhi@Ayushis-MacBook-Air c:c++ % cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac5.c -o prac5 && "/Users/ayushilodhi/Documents/c:c++/"prac5
Enter three numbers: 27 17 18
Maximum number = 27%
ayushilodhi@Ayushis-MacBook-Air c:c++ %

```

else statement.

2. **Ternary operator:** The ternary operator in C, also known as the conditional operator, provides a concise way to express simple if-else statements in a single line.

- Program to check if a number is even or odd using the ternary operator.

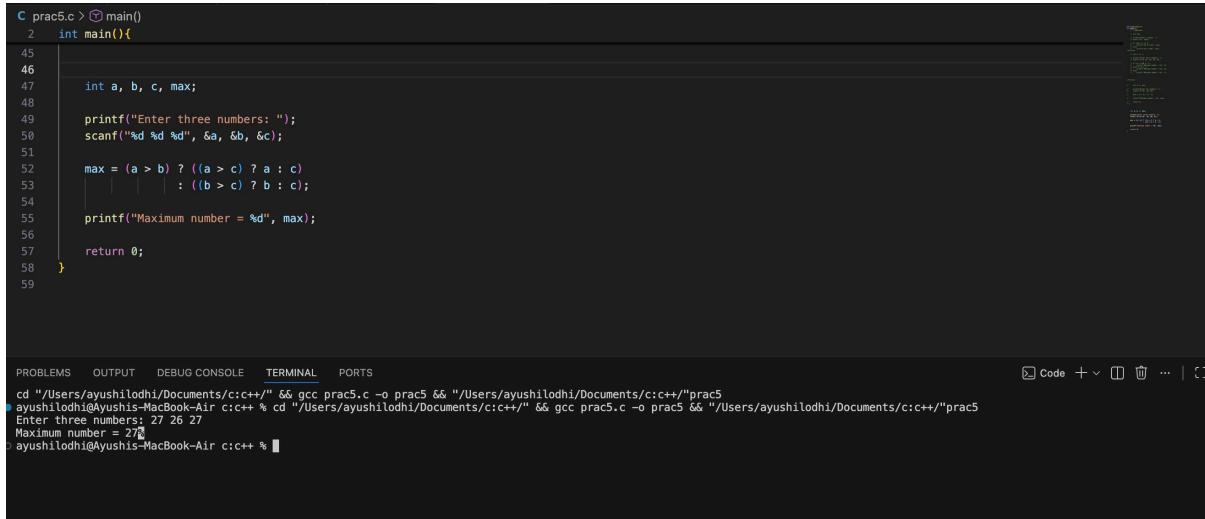
```

30 //ternary
31
32 int a, b, max;
33
34 printf("Enter two numbers: ");
35 scanf("%d %d", &a, &b);
36
37 max = (a > b) ? a : b;
38
39 printf("Maximum number = %d", max);
40
41 return 0;
42
43 }
44

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac5.c -o prac5 && "/Users/ayushilodhi/Documents/c:c++/"prac5
ayushilodhi@Ayushis-MacBook-Air c:c++ % cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac5.c -o prac5 && "/Users/ayushilodhi/Documents/c:c++/"prac5
Enter two numbers: 27 17
Maximum number = 27%
ayushilodhi@Ayushis-MacBook-Air c:c++ %

```

- Program to check the maximum of three numbers using the ternary operator.

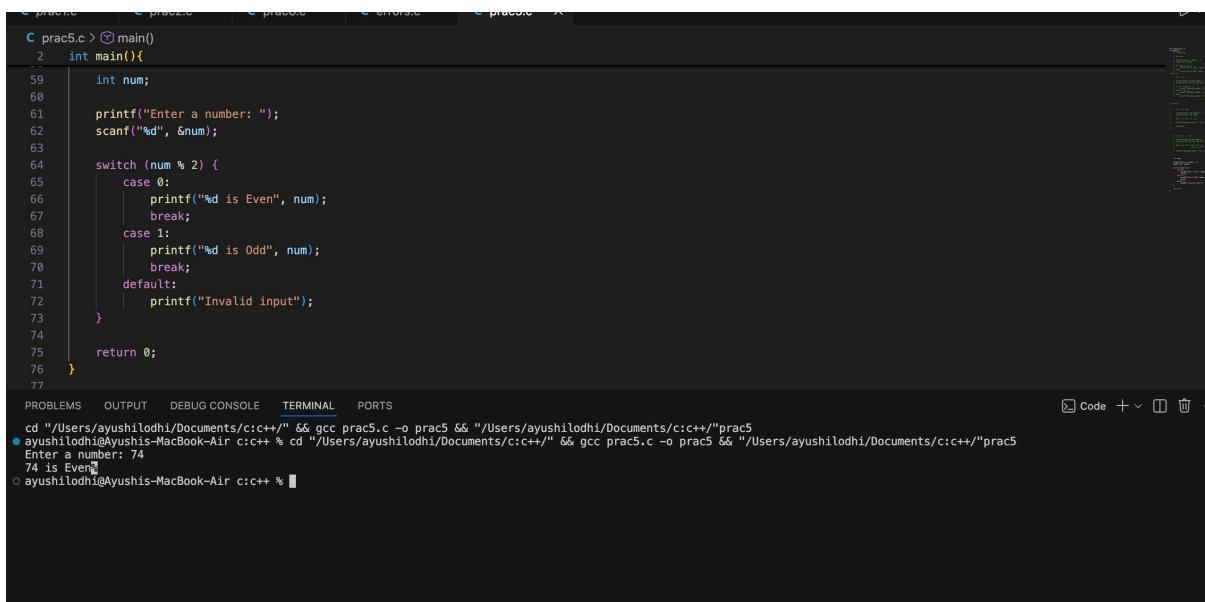


```
C prac5.c > main()
2 int main(){
45
46
47     int a, b, c, max;
48
49     printf("Enter three numbers: ");
50     scanf("%d %d %d", &a, &b, &c);
51
52     max = (a > b) ? ((a > c) ? a : c)
53     | | | | : ((b > c) ? b : c);
54
55     printf("Maximum number = %d", max);
56
57     return 0;
58 }
59

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac5.c -o prac5 && "/Users/ayushilodhi/Documents/c:c++/"< /dev/null
ayushilodhi@Ayushis-MacBook-Air:~/Documents/c:c++% cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac5.c -o prac5 && "/Users/ayushilodhi/Documents/c:c++/"< /dev/null
Enter three numbers: 27 26 27
Maximum number = 27
ayushilodhi@Ayushis-MacBook-Air:~/Documents/c:c++%
```

3. Switch-Case: The switch-case statement is a control structure used to execute one block of code from multiple choices based on the value of an expression.

- Program to check if a number is even or odd using the switch case.



```
C prac5.c > main()
2 int main(){
59     int num;
60
61     printf("Enter a number: ");
62     scanf("%d", &num);
63
64     switch (num % 2) {
65         case 0:
66             printf("%d is Even", num);
67             break;
68         case 1:
69             printf("%d is Odd", num);
70             break;
71         default:
72             printf("Invalid input");
73     }
74
75     return 0;
76 }
77

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac5.c -o prac5 && "/Users/ayushilodhi/Documents/c:c++/"< /dev/null
ayushilodhi@Ayushis-MacBook-Air:~/Documents/c:c++% cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac5.c -o prac5 && "/Users/ayushilodhi/Documents/c:c++/"< /dev/null
Enter a number: 74
74 is Even
ayushilodhi@Ayushis-MacBook-Air:~/Documents/c:c++%
```

- Program to check the maximum of three numbers using the switch case.

```
C prac5.c > main()
2 int main(){
76     int a, b, c, max;
77
78     printf("Enter three numbers: ");
79     scanf("%d %d %d", &a, &b, &c);
80
81     if (a >= b && a >= c)
82         max = 1;
83     else if (b >= c)
84         max = 2;
85     else
86         max = 3;
87
88     switch (max) {
89     case 1:
90         printf("Maximum number = %d", a);
91         break;
92     case 2:
93         printf("Maximum number = %d", b);
94         break;
95     case 3:
96         printf("Maximum number = %d", c);
97         break;
98    }
99
100    return 0;
}
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
Code + ▾
```

cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac5.c -o prac5 && "/Users/ayushilodhi/Documents/c:c++/"prac5
ayushilodhi@ayushis-MacBook-Air c:c++ % cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac5.c -o prac5 && "/Users/ayushilodhi/Documents/c:c++/"prac5
Enter three numbers: 34 36 72
Maximum number = 72
ayushilodhi@ayushis-MacBook-Air c:c++ %

Practical-6

Aim: Print numbers 1-10 using loop, sum of n numbers, use break & continue.

```
C prac1.c    C prac2.c    C prac6.c ×
C prac6.c > ...
1  #include <stdio.h>
2
3 int main() {
4     int i, n, sum = 0;
5
6     // Print numbers from 1 to 10
7     printf("Numbers from 1 to 10:\n");
8     for (i = 1; i <= 10; i++) {
9         printf("%d ", i);
10    }
11
12    // Sum of n numbers
13    printf("\nEnter value of n: ");
14    scanf("%d", &n);
15
16    for (i = 1; i <= n; i++) {
17        sum += i;
18    }
19
20    printf("Sum of first %d natural numbers = %d\n", n, sum);
21
22    // Use of break and continue
23    printf("\nUse of break and continue:\n");
24
25    for (i = 1; i <= 10; i++) {
26        if (i == 5)
27            continue; // skips 5
28
29        if (i == 8)
30            break; // stops loop at 8
31
32        printf("%d ", i);
33    }
34
35    return 0;
36 }
37

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
ayushilodhi@Ayushis-MacBook-Air c:c++ % cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac2.c -o prac2 && "/Users/ayushilodhi/Documents/c:c++/"prac2
Character = c
Double value = 8.900000
Values after swapping:
a = 10, b = 5
ayushilodhi@Ayushis-MacBook-Air c:c++ % cd "/Users/ayushilodhi/Documents/c:c++/" && gcc prac6.c -o prac6 && "/Users/ayushilodhi/Documents/c:c++/"prac6
Numbers from 1 to 10:
1 2 3 4 5 6 7 8 9 10
Enter value of n: 7
Sum of first 7 natural numbers = 28
Use of break and continue:
1 2 3 4 6 7
ayushilodhi@Ayushis-MacBook-Air c:c++ %
```

