

C Programming

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Fundamentals of C Programming

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Q1. What is the purpose of the main() function in a C program? Explain its significance.

The main() function is the starting point of every C program. When the program runs, execution begins from main(). It controls the overall flow by calling other functions and executing statements. The function usually returns an integer value to indicate whether the program ran successfully or encountered an error. It acts as the central hub of the program where all major tasks are organized and managed. The structure of the main() defines how the program will operate step by step. Without main(), a C program cannot execute. Overall, the main() plays a vital role in linking all parts of the program together and ensuring proper execution.

Q2. Explain the difference between a variable declaration and a variable initialization in C.

In C, a variable declaration means introducing a variable to the program by specifying its data type and name. It tells the compiler to reserve memory for that variable. However, at this stage, the variable does not have a defined value. For example, `int x;` declares a variable named `x`.

A variable initialization, on the other hand, means assigning a value to the variable when it is created. This gives the variable a definite starting value. For example, `int x = 5;` both declare the variable and initialize it with the value 5.

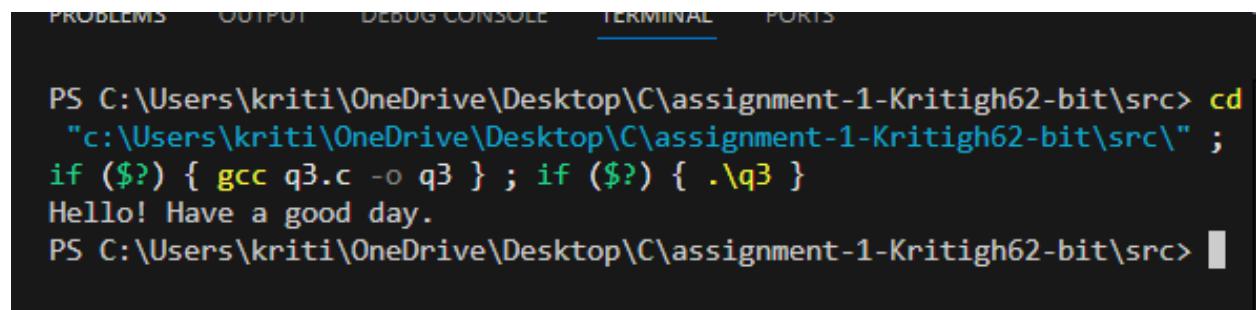
The key difference is that declaration only creates the variable and reserves memory, while initialization gives the variable its first meaningful value.

Q3. Write a C program to display a personalized greeting message. (Should contain 'hello' or 'welcome' in the message)

```
#include <stdio.h>

int main() {
    printf("Hello! Have a good day.");
    return 0;
}
```

Output



The screenshot shows a terminal window with the following content:

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

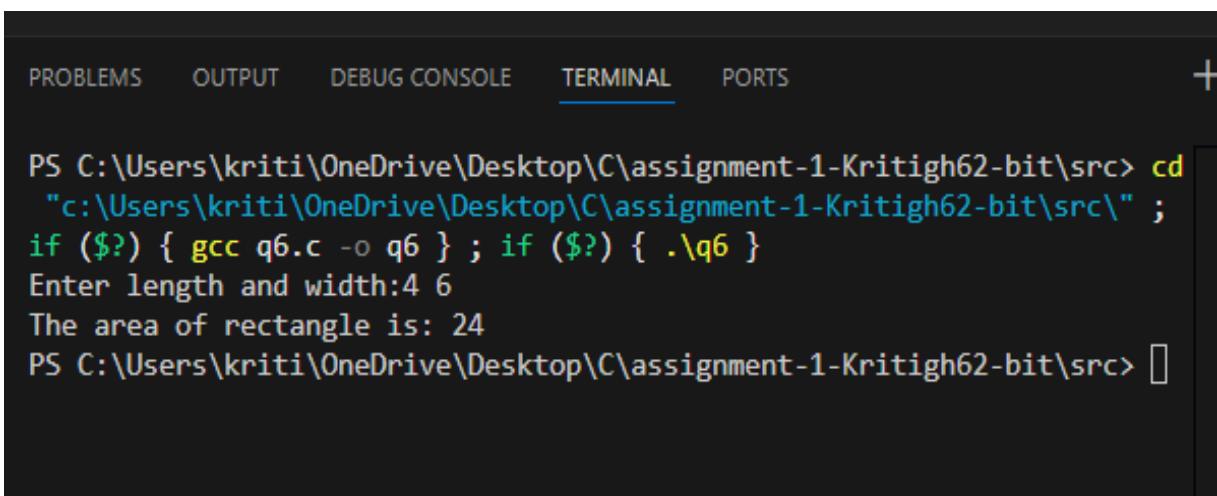
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src> cd "c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src\" ;
if (?) { gcc q3.c -o q3 } ; if (?) { .\q3 }
Hello! Have a good day.
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src>
```

Q6. Write a C program to calculate the area of a rectangle. Prompt the user to enter the length and width, and display the result.

```
#include<stdio.h>
int main ()
{
    // Declare variables: l=length, w= width, a=area//
    int l, w, a;
    //prompt the user to enter length and width//
    printf("Enter length and width:", l, w);
    // Read length and width//
    scanf("%d %d", &l , &w);
    // Calculate the area of a rectangle//
    a = l * w ;
    // Display the calculated output//
    printf("The area of rectangle is %d", a);
    return 0;

}
```

Output



The screenshot shows a terminal window with the following content:

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS +  
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src> cd "c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src\" ; if ($?) { gcc q6.c -o q6 } ; if (?) { .\q6 }  
Enter length and width:4 6  
The area of rectangle is: 24  
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src> []
```

Q7. What is the role of the scanf() function in C? Provide an example of its usage.

In C, the `scanf()` function is the general-purpose input function, which is used to read input from the user and store it in variables during program execution. It reads data from the keyboard and requires format specifiers like `%d` for integers, `%f` for floats, and `%c` for characters to determine the input type. The `&` operator is used to pass the address of the variable so that `scanf()` can store the value at the correct memory location.

For example:

```
#include<stdio.h>

int main(){
    // Age, Height, Initial //
    int age;
    float height;
    char initial;

    printf("Enter age, height, initial:");
    scanf("%d %f %c", &age, &height, &initial);

    printf("Age: %d\nHeight: %f\nInitial: %c\n", age, height, initial);

    return 0;
}
```

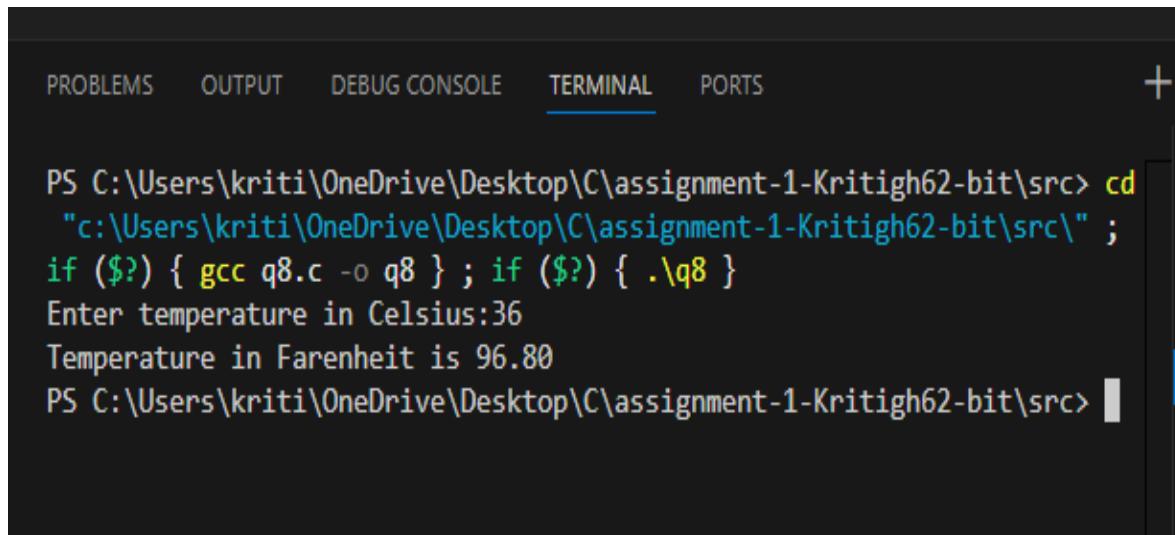
Q8. Write a C program to convert temperature from Celsius to Fahrenheit. Prompt the user for a temperature in Celsius and display the equivalent temperature in Fahrenheit. (Formula: fahrenheit = (celsius * 9 / 5) + 32)

```
#include<stdio.h>
int main()
{
    float Celsius, Fahrenheit;
    printf("Enter temperature in Celsius:", Celsius);
    scanf("%f", &Celsius);

    Fahrenheit = (Celsius * 9 / 5) + 32;

    printf("Temperature in Farenheit is %.2f\n", farenheit );
    return 0;
}
```

Output



The screenshot shows a terminal window with the following interface elements:

- Top navigation bar: PROBLEMS, OUTPUT, DEBUG CONSOLE, TERMINAL (underlined), PORTS, and a plus sign icon.
- Terminal content:

```
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src> cd
"c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src\" ;
if ($?) { gcc q8.c -o q8 } ; if (?) { .\q8 }
Enter temperature in Celsius:36
Temperature in Farenheit is 96.80
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src>
```

The terminal shows the execution of a C program named q8. It first changes directory to "C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src". Then it runs the command "gcc q8.c -o q8" to compile the program. After compilation, it runs the executable "q8" by typing ".\q8". Finally, it prompts the user to enter a temperature in Celsius (36), calculates the equivalent temperature in Fahrenheit (96.80), and displays the result.

**Q9. Input a number representing days and print the equivalent number of weeks and days.
(Example: 10 days = 1 week and 3 days)**

```
#include<stdio.h>
int main()
{
    int days, weeks;
    printf("Enter a number:");
    scanf("%d", &days);
    weeks = days / 7;
    days = days % 7;
    printf("%d weeks and %d days", weeks , days);
    return 0;
}
```

Output

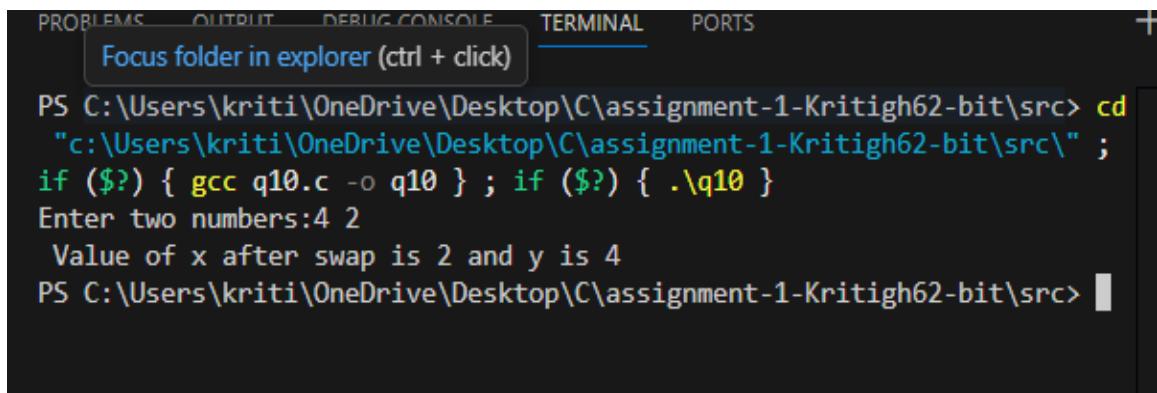
```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS + 

PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src> cd "c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src\" ; if ($?) { gcc q9.c -o q9 } ; if ($?) { .\q9 }
Enter a number:17
2 weeks and 3 days
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src>
```

Q10. Write a C program to swap the values of two variables using a temporary variable.

```
#include<stdio.h>
int main()
{
    int x,y;
    int temp;
    printf("Enter two numbers:");
    scanf("%d %d", &x, &y);
    temp = x;
    x = y;
    y = temp;
    printf(" Value of x after swap is %d and y is %d\n", x, y);
    return 0;
}
```

Output



The screenshot shows a terminal window with the following output:

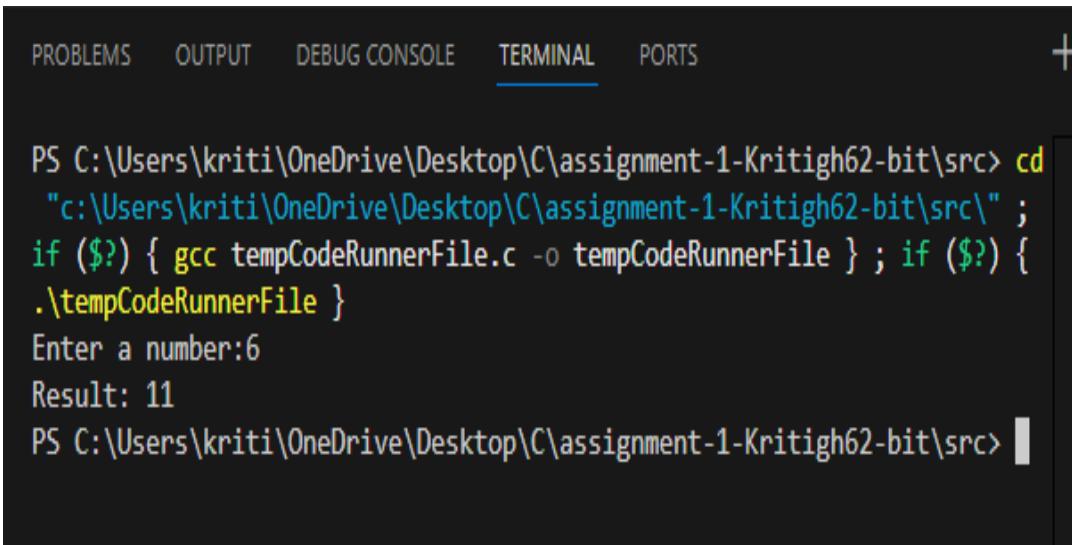
```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS +  
Focus folder in explorer (ctrl + click)  
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src> cd  
"c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src\" ;  
if ($?) { gcc q10.c -o q10 } ; if ($?) { .\q10 }  
Enter two numbers:4 2  
Value of x after swap is 2 and y is 4  
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src>
```

Q11. Write a C expression that performs the following operations in a single line:
increment a variable by 1, multiply it by 3, and subtract 10.

```
#include<stdio.h>
int main()
{
    int x;
    printf("Enter a number:");
    scanf("%d", &x);

    x = (x + 1) * 3 - 10;
    printf("Result: %d\n", x);
    return 0;
}
```

Output



```
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src> cd "c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src\" ;
if ($?) { gcc tempCodeRunnerFile.c -o tempCodeRunnerFile } ; if ($?) {
.\tempCodeRunnerFile }
Enter a number:6
Result: 11
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src>
```

Q12. Given three variables a, b, and c, write an expression that checks if a is greater than b and c is not equal to 0.

```
#include <stdio.h>
int main()
{
    int a, b, c;
    printf("Enter number a, b, c:");
    scanf("%d %d %d", &a, &b, &c);

    int result;
    result = a > b && c != 0;

    printf("Condition is %d", result);
    // if (a > b && c != 0) {
    //     printf("%d is greater than %d", a, b);
    // } else {
    //     printf("%d is not equal to 0", c);
    // }

    return 0;
}
```

Output

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS +  
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src> cd "c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src\" ; if ($?) { gcc tempCodeRunnerFile.c -o tempCodeRunnerFile } ; if (?) { .\tempCodeRunnerFile }  
Enter number a, b, c:4 1 5  
Condition is 1  
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src>
```

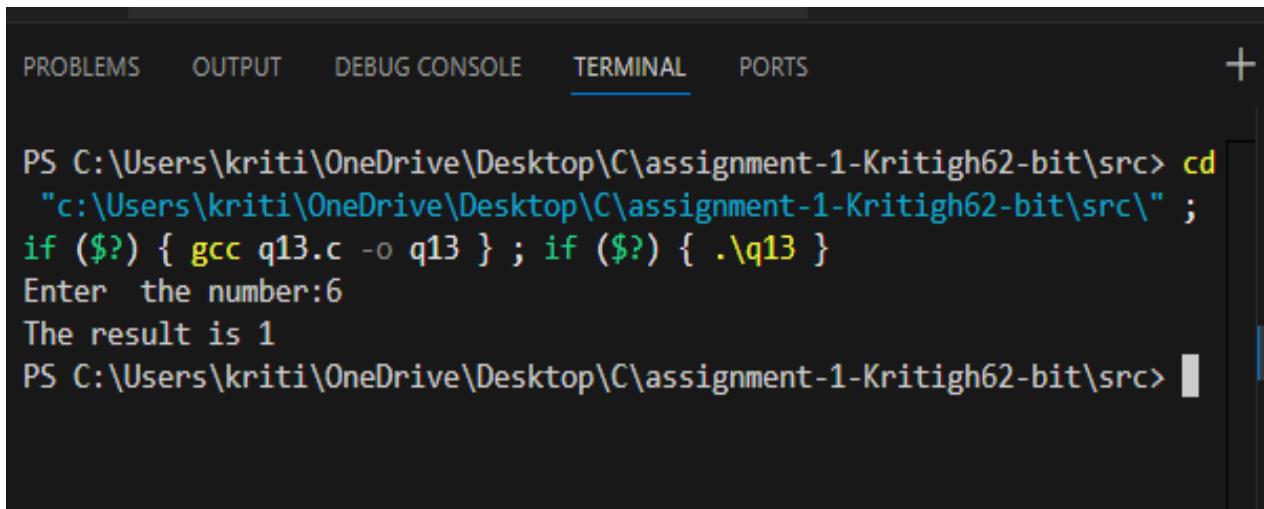
Q13. Write a C expression that evaluates whether a number is divisible by both 2 and 3 (without using the modulus operator).

```
#include<stdio.h>

int main()
{
    int num;
    printf("Enter the number:");
    scanf("%d", &num);
    int result;
    result = (num % 2 == 0) && (num % 3 == 0);
    printf("The result is %d\n", result );
    return 0;

}
```

Output

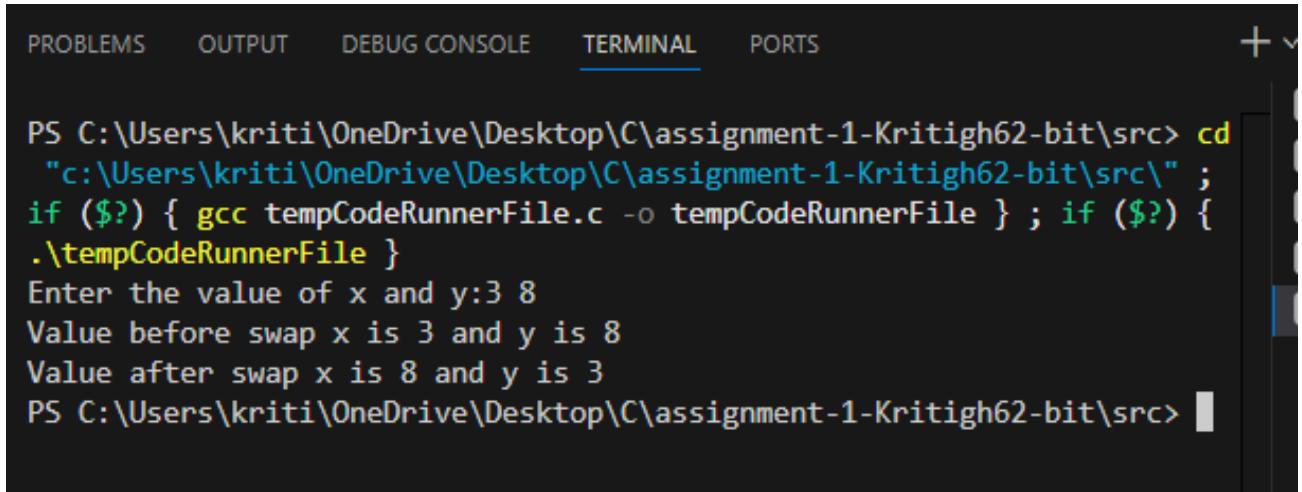


```
PROBLEMS    OUTPUT    DEBUG CONSOLE    TERMINAL    PORTS    +  
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\gh62-bit\src> cd  
"c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\gh62-bit\src\" ;  
if ($?) { gcc q13.c -o q13 } ; if (?) { .\q13 }  
Enter the number:6  
The result is 1  
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\gh62-bit\src>
```

Q14. Create an expression that swaps the values of two variables, x and y without using a temporary variable.

```
#include<stdio.h>
int main()
{
    int x , y;
    printf("Enter the value of x and y:");
    scanf("%d %d", &x, &y);
    printf("Value before swap x is %d and y is %d\n", x , y);
    x = x + y;
    y = x - y;
    x = x - y;
    printf("Value after swap x is %d and y is %d\n", x , y);
    return 0;
}
```

Output



The screenshot shows a terminal window with the following output:

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS + ▾

PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti62-bit\src> cd "c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti62-bit\src\" ; if ($?) { gcc tempCodeRunnerFile.c -o tempCodeRunnerFile } ; if ($?) { .\tempCodeRunnerFile }

Enter the value of x and y:3 8
Value before swap x is 3 and y is 8
Value after swap x is 8 and y is 3
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti62-bit\src>
```

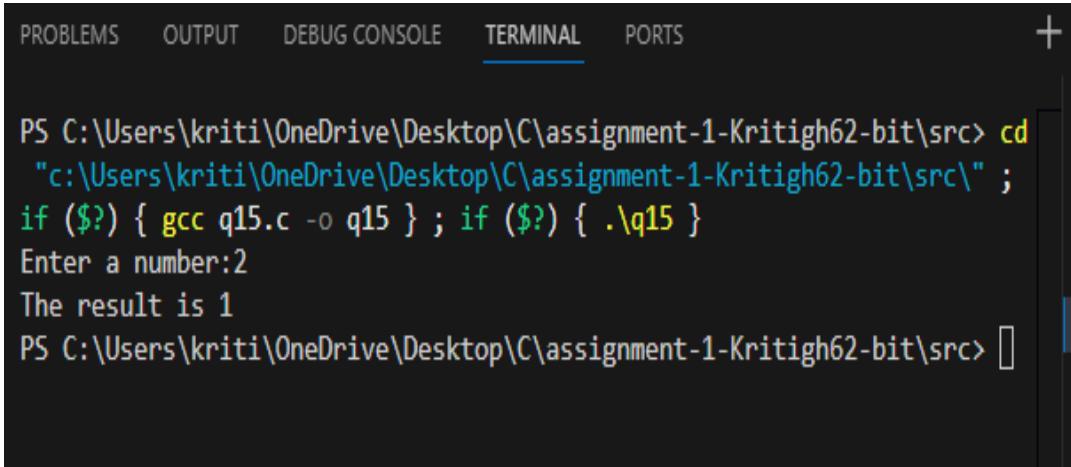
Q15. Write an expression that checks if a number is both positive and even.

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

    int result;
    result =  num > 0 && num % 2 == 0 ;
    printf("The result is %d\n", result);

    return 0;
}
```

Output



```
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src> cd "c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src\" ;
if (?) { gcc q15.c -o q15 } ; if (?) { .\q15 }
Enter a number:2
The result is 1
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src> []
```

Q16. Given two variables x and y, write an expression that calculates the average of their values.

```
#include<stdio.h>
int main()
{
    float x,y,average;
    printf("Enter the value of x and y:");
    scanf("%f %f", &x, &y);
    average = (x+y)/2;
    printf("The average is %.2f\n:", average);
    return 0;
}
```

Output



The screenshot shows a terminal window with the following output:

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS +  
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src> cd "c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src\" ; if ($?) { gcc q16.c -o q16 } ; if ($?) { .\q16 }  
Enter the value of x and y:4 9  
The average is 6.50  
:  
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src>
```

Q17. Create an expression that checks if a given character is an uppercase letter.

```
#include<stdio.h>
int main()
{
    char character;
    int result;
    printf("Enter a character:");
    scanf("%c", &character);
    result = (character >= 'A') && (character <= 'Z');
    printf("The result is %d\n", result);
    return 0;
}
```

Output



The screenshot shows a terminal window with the following content:

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS +  
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti62-bit\src> cd "c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti62-bit\src\" ; if ($?) { gcc q17.c -o q17 } ; if ($?) { .\q17 }  
Enter a character:K  
The result is 1  
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti62-bit\src>
```

The terminal window has tabs for PROBLEMS, OUTPUT, DEBUG CONSOLE, TERMINAL (which is selected), and PORTS. There is also a '+' icon for creating new tabs.

Q18. Write a C expression that calculates the sum of the squares of three different numbers.

```
#include<stdio.h>
int main()
{
    int a, b, c, sum;
    printf("Enter three numbers:");
    scanf("%d %d %d", &a, &b, &c);
    sum = (a*a) + (b*b) + (c*c);
    printf("The sum of the square root is %d\n:", sum);
    return 0;

}
```

Output

```
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti62-bit\src> cd "c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti62-bit\src" ;
if ($?) { gcc tempCodeRunnerFile.c -o tempCodeRunnerFile } ; if (?) {
.\tempCodeRunnerFile }
Enter three numbers:3 6 8
The sum of the square root is 109
:
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti62-bit\src>
```

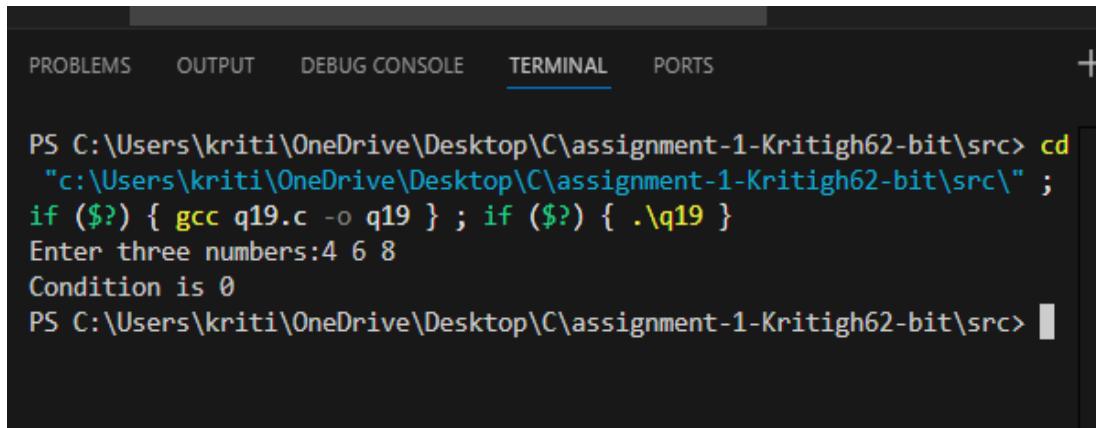
Q19. Given three variables a, b, and c, write an expression that checks if a is equal to b and b is not equal to c.

```
#include<stdio.h>
int main()
{
    int a, b, c;
    printf("Enter three numbers:");
    scanf("%d %d %d", &a, &b, &c);

    int result;
    result = a == b && b != c;
    printf("Condition is %d", result);

    return 0;
}
```

Output



```
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti62-bit\src> cd "c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti62-bit\src\" ;
if (?) { gcc q19.c -o q19 } ; if (?) { .\q19 }
Enter three numbers:4 6 8
Condition is 0
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti62-bit\src>
```

Q20. Write an expression that checks if a number is a multiple of either 3 or 5.

```
#include<stdio.h>
int main()
{
    int x;
    printf("Enter a number:");
    scanf("%d", &x);

    int result;
    result = x % 3==0 || x % 5==0 ;
    printf(" The result is %d\n ", result);

return 0;
}
```

Output

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS + ·

PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src> cd "c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src\" ;
if (?) { gcc q20.c -o q20 } ; if (?) { .\q20 }
Enter a number:3
The result is 1

PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src>
```

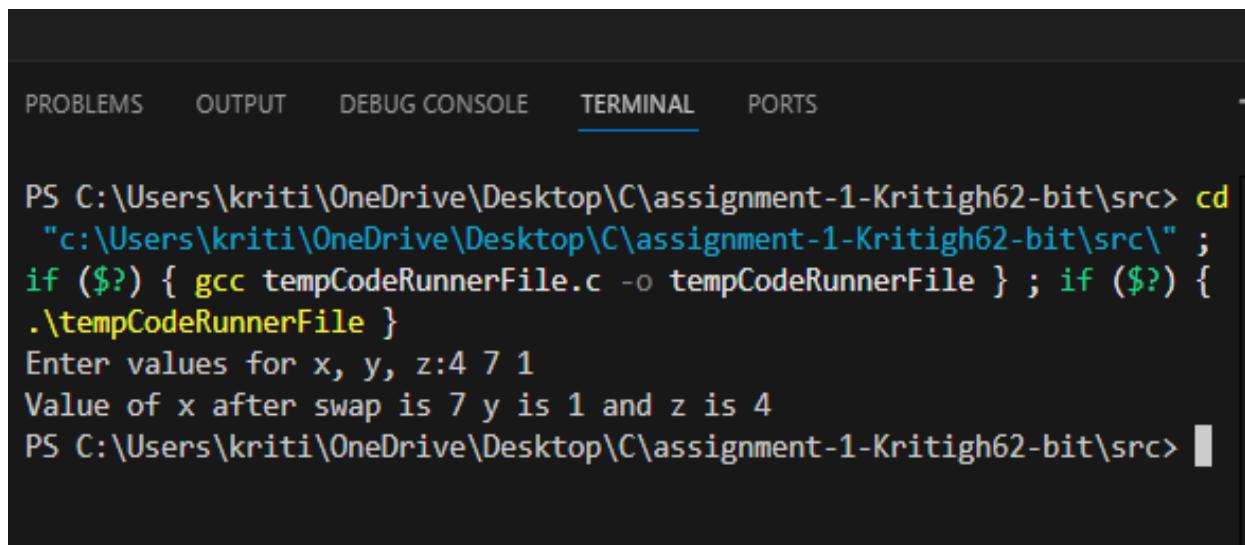
Q21. Create an expression that swaps the values of three variables x, y, and z in a cyclic order (i.e., x becomes y, y becomes z, and z becomes x).

```
#include<stdio.h>
int main()
{
    int x, y, z, temp;
    printf("Enter values for x, y, z:");
    scanf("%d %d %d",&x, &y, &z );

    temp = x;
    x = y;
    y = z;
    z = temp;

    printf("Value of x after swap is %d y is %d and z is %d\n", x, y, z);
    return 0;
}
```

Output



The screenshot shows a terminal window with the following content:

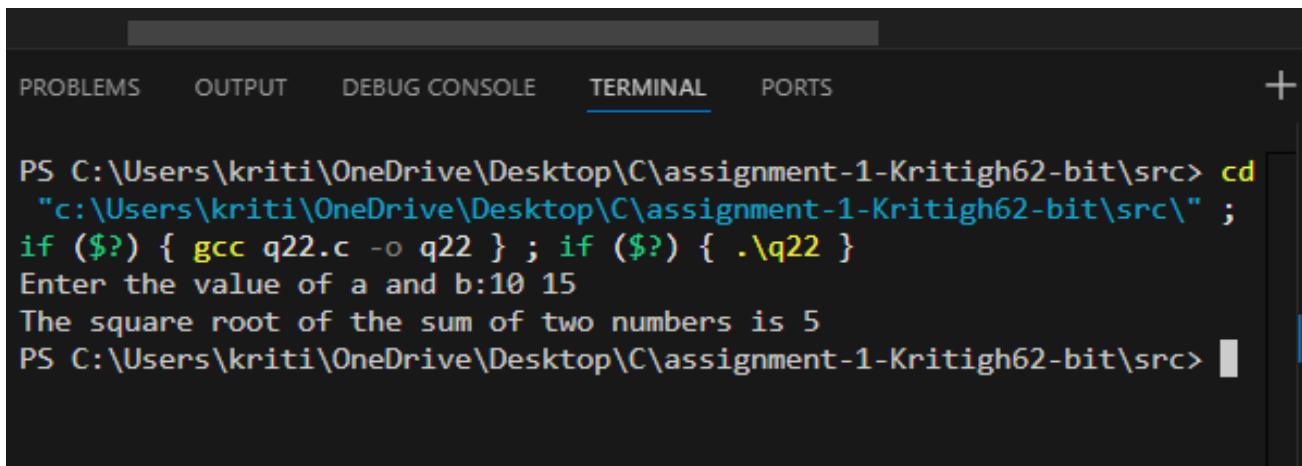
```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src> cd "c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src\" ; if ($?) { gcc tempCodeRunnerFile.c -o tempCodeRunnerFile } ; if (?) { .\tempCodeRunnerFile }
Enter values for x, y, z:4 7 1
Value of x after swap is 7 y is 1 and z is 4
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src>
```

Q22. Write a C expression that calculates the square root of the sum of two numbers, rounded to the nearest integer.

```
#include<stdio.h>
#include<math.h>
int main()
{
    int a, b, sum;
    printf("Enter the value of a and b:");
    scanf("%d %d", &a, &b);
    sum = (a + b);
    int result;
    result = sqrt(sum);
    printf("The square root of the sum of two numbers is %d\n", result);
    return 0;
}
```

Output



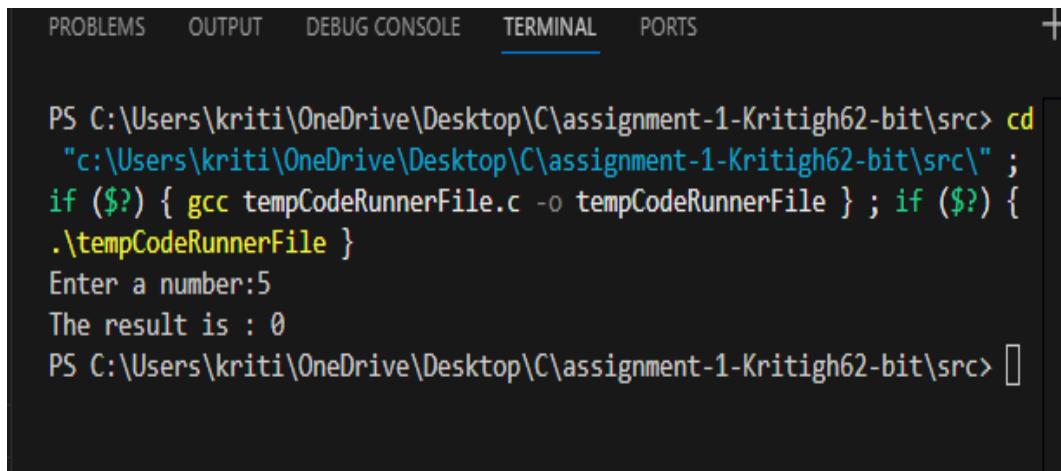
```
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src> cd "c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src\" ; if ($?) { gcc q22.c -o q22 } ; if ($?) { .\q22 }
Enter the value of a and b:10 15
The square root of the sum of two numbers is 5
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src>
```

Q23. Given a variable num, write an expression that checks if it is a power of 2.

```
#include<stdio.h>
int main()
{
    int num, result;
    printf("Enter a number:");
    scanf("%d", &num);

    result = !(num & (num - 1));
    printf("The result is : %d\n", result);
    return 0;
}
```

Output



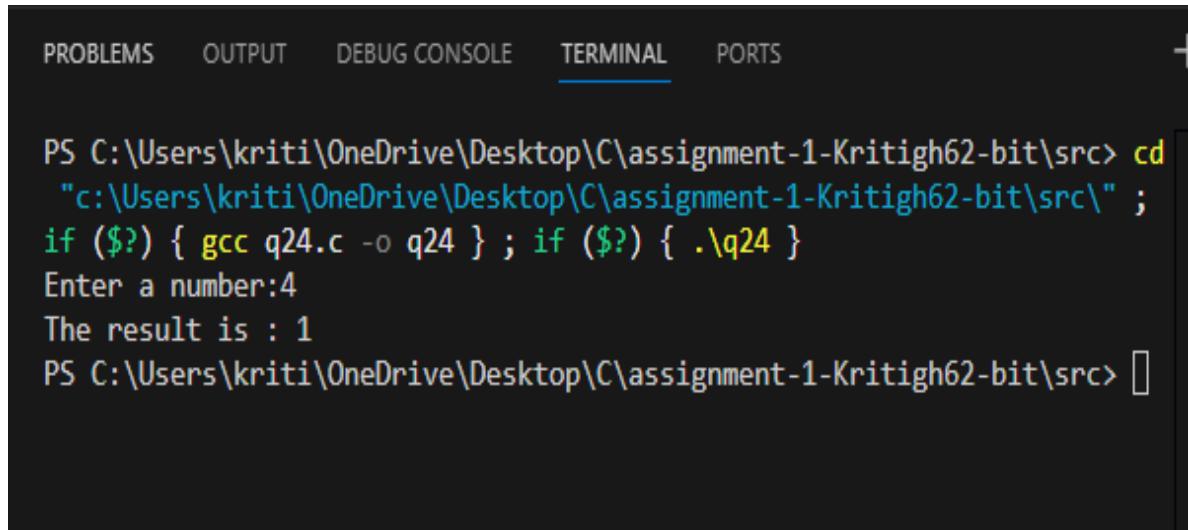
The screenshot shows a terminal window with the following content:

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS +  
  
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti64-bit\src> cd "c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti64-bit\src\" ; if (?) { gcc tempCodeRunnerFile.c -o tempCodeRunnerFile } ; if (?) { .\tempCodeRunnerFile }  
Enter a number:5  
The result is : 0  
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti64-bit\src> []
```

Q24. Create an expression that checks if a given number is a perfect square.

```
#include<stdio.h>
#include<math.h>
int main()
{
    int num;
    printf("Enter a number:");
    scanf("%d", &num);
    int x = sqrt(num);
    int result = (x * x == num);
    printf("The result is : %d\n", result);
    return 0;
}
```

Output



The screenshot shows a terminal window with the following output:

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS +  
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src> cd "c:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src\" ; if ($?) { gcc q24.c -o q24 } ; if ($?) { .\q24 }  
Enter a number:4  
The result is : 1  
PS C:\Users\kriti\OneDrive\Desktop\C\assignment-1-Kriti\src>
```