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Programming

About

This project is completed as part of Task 3 for Computer Programming, covering the completion of various C programming tasks.

~ Abhishek Adhikari



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Project Documentation: C Programming Exercises

I. Introduction

This document provides a comprehensive overview of various C programming exercises. Each section includes the purpose of the program, the code, and instructions for compiling and running the program.

2. Programs

2.1 Check if a Number is Even or Odd

Explanation:

- ❖ The program prompts the user to enter an integer.
- ❖ It checks if the number is even by using the modulo operator %.
- ❖ If the number is divisible by 2, it is even; otherwise, it is odd.

Code:

```
1  /*
2     Author: Abhishek Adhikari
3     Date: 10th August 2024
4     Topic: Even or Odd Number
5     Purpose: Check whether a given number is even or odd.
6     Hint: number%2 - even else odd
7
8     Additional: The program will keep asking for input until a valid integer is entered.
9  */
10
11 #include <stdio.h>
12 #include <stdlib.h>
13 int main(){
14     int number, validInput;
15
16     do
17     {
18         printf("Enter an integer: ");
19         validInput = scanf("%d", &number);
20
21         if (validInput != 1)
22         {
23             printf("\n\033[1;31mInvalid input. Please enter an integer.\033[0m\n\n");
24             while (getchar() != '\n')
25                 ;
26         }
27     } while (validInput != 1);
28
29     if (number % 2 == 0)
30         printf("\033[1;33m The number %d is Even.\033[0m\n\n", number);
31     else
32         printf("\033[1;33m The number %d is Odd.\033[0m\n\n", number);
33     system("pause");
34     return 0;
35 }
36 }
```

Output:

```
C:\Users\adhik\Desktop\C Prc X + v
Enter an integer: alphabet
Invalid input. Please enter an integer.
Enter an integer: 4
The number 4 is Even.
Press any key to continue . . . |
```

2.2 Check if a Number is Positive or Negative

Explanation:

- ❖ The program checks if the number entered is positive, negative, or zero.

Code:

```
1  /*
2     Author: Abhishek Adhikari
3     Date: 10th August 2024
4     Topic: Positive or Negative Number
5     Purpose: Check whether a given number is positive or negative.
6     Hint: number > 0; number < 0
7
8     Additional: The program will keep asking for input until a valid integer is entered.
9  */
10
11 #include <stdio.h>
12 #include <stdlib.h>
13 int main(){
14     int number, validInput;
15
16     do
17     {
18         printf("Enter an integer: ");
19         validInput = scanf("%d", &number);
20
21         if (validInput != 1)
22         {
23             printf("\n\033[1;31mInvalid input. Please enter an integer.\033[0m\n\n");
24             while (getchar() != '\n')
25                 ;
26         }
27     } while (validInput != 1);
28
29     if (number > 0)
30         printf("The number is Positive.\n");
31     else if (number < 0)
32         printf("The number is Negative.\n");
33     else
34         printf("The number is Zero.\n");
35     system("pause");
36     return 0;
37 }
38 }
```

Output:

```
C:\Users\adhik\Desktop\C Prc X + v
Enter an integer: int
Invalid input. Please enter an integer.
Enter an integer: 65
The number is Positive.
Press any key to continue . . . |
```

2.3 Check if a Year is a Leap Year

Explanation:

- ❖ The program determines if a year is a leap year using conditional checks.

Code:

```
1  /*
2     Author: Abhishek Adhikari
3     Date: 10th August 2024
4     Topic: Leap Year Check
5     Purpose: Find whether a given year is a leap year or not.
6
7     Additional: The program will keep asking for input until a valid integer is entered.
8  */
9
10 #include <stdio.h>
11 #include <stdlib.h>
12 int main()
13 {
14     int year, validInput;
15
16     do
17     {
18         printf("Enter a year: ");
19         validInput = scanf("%d", &year);
20
21         if (validInput != 1)
22         {
23             printf("\n\033[1;31mInvalid input. Please enter an integer.\033[0m\n\n");
24             while (getchar() != '\n')
25                 ;
26         }
27     } while (validInput != 1);
28
29     if ((year % 4 == 0 && year % 100 != 0) || (year % 400 == 0))
30         printf("The year is a Leap Year.\n\n");
31     else
32         printf("The year is not a Leap Year.\n\n");
33     system("pause");
34     return 0;
35 }
36
```

Output:

```
C:\Users\adhik\Desktop\C Prc X + v
Enter a year: fr
Invalid input. Please enter an integer.
Enter a year: 2006
The year is not a Leap Year.
Press any key to continue . . .
```

2.4 Check Voting Eligibility Based on Age

Explanation:

- ❖ The program checks if the user's age is 18 or above to determine voting eligibility.

Code:

```
1  /*
2     Author: Abhishek Adhikari
3     Date: 10th August 2024
4     Topic: Voting Eligibility
5     Purpose: Determine if a candidate is eligible for voting.
6     Hint: age >= 18
7
8     Additional: The program will keep asking for input until a valid integer is entered.
9  */
10
11 #include <stdio.h>
12 #include <stdlib.h>
13 int main()
14 {
15     int age, validInput;
16
17     do
18     {
19         printf("Enter your age: ");
20         validInput = scanf("%d", &age);
21
22         if (validInput != 1)
23         {
24             printf("\n\033[1;31mInvalid input. Please enter an integer.\033[0m\n\n");
25             while (getchar() != '\n')
26                 ;
27         }
28     } while (validInput != 1);
29
30     if (age >= 18)
31         printf("You are eligible to vote.\n\n");
32     else
33         printf("You are not eligible to vote.\n\n");
34     system("pause");
35     return 0;
36 }
37 }
```


Output:

```
C:\Users\adhik\Desktop\C Prc X + v
Enter your age: df
Invalid input. Please enter an integer.
Enter your age: 25
You are eligible to vote.
Press any key to continue . . . |
```

2.5 Determine Value of 'n' Based on 'm'

Explanation:

- ❖ The program evaluates the value of 'm' and sets 'n' based on the given conditions.

Code:

```
1  /*
2   Author: Abhishek Adhikari
3   Date: 10th August 2024
4   Topic: Height Categorization
5   Purpose: Categorize a person according to their height.
6   Hint: height < 150 is short, 150 <= height < 165 is average, height >= 165 is tall
7
8   Additional: The program will keep asking for input until a valid integer is entered.
9  */
10
11 #include <stdio.h>
12 #include <stdlib.h>
13 int main()
14 {
15     int height, validInput;
16
17     do
18     {
19         printf("Enter your height in cm: ");
20         validInput = scanf("%d", &height);
21
22         if (validInput != 1)
23         {
24             printf("\n\033[1;31mInvalid input. Please enter an integer.\033[0m\n\n");
25             while (getchar() != '\n')
26                 ;
27         }
28     } while (validInput != 1);
29
30     if (height < 150)
31         printf("You are categorized as Short.\n");
32     else if (height >= 150 && height < 165)
33         printf("You are categorized as Average.\n");
34     else
35         printf("You are categorized as Tall.\n");
36     system("pause");
37     return 0;
38 }
39 }
```


Output:

```
C:\Users\adhik\Desktop\C Prc X + v
Enter an integer value for m: f
Invalid input. Please enter an integer.
Enter an integer value for m: 6
The value of n is: 1
Press any key to continue . . . |
```

2.6 Categorize a Person's Height

Explanation:

- ❖ The program categorizes the height of a person into "Short", "Average", or "Tall".

Code:

```
1  /*
2   Author: Abhishek Adhikari
3   Date: 10th August 2024
4   Topic: Determine Value of n
5   Purpose: Display the value of n based on the value of m.
6   Hint: n = 1 when m > 0, n = 0 when m = 0, n = -1 when m < 0
7
8   Additional: The program will keep asking for input until a valid integer is entered.
9  */
10
11 #include <stdio.h>
12 #include <stdlib.h>
13 int main()
14 {
15     int m, n, validInput;
16
17     do
18     {
19         printf("Enter an integer value for m: ");
20         validInput = scanf("%d", &m);
21
22         if (validInput != 1)
23         {
24             printf("\n\033[1;31mInvalid input. Please enter an integer.\033[0m\n\n");
25             while (getchar() != '\n')
26                 ;
27         }
28     } while (validInput != 1);
29
30     if (m > 0)
31         n = 1;
32     else if (m == 0)
33         n = 0;
34     else
35         n = -1;
36
37     printf("The value of n is: %d\n", n);
38     system("pause");
39     return 0;
40 }
41
```

Output:

```
C:\Users\adhik\Desktop\C Prc X + v
Enter your height in cm: cm
Invalid input. Please enter an integer.
Enter your height in cm: 162
You are categorized as Average.
Press any key to continue . . .
```

2.7 Find the Largest of Three Numbers

Explanation:

- ❖ The program determines the largest of the three input numbers.

Code:

```
1  /*
2   Author: Abhishek Adhikari
3   Date: 10th August 2024
4   Topic: Largest of Three Numbers
5   Purpose: Find the largest of three numbers.
6   Hint: Use conditional statements to compare the numbers.
7
8   Additional: The program will keep asking for input until three valid integers are entered.
9  */
10
11 #include <stdio.h>
12 #include <stdlib.h>
13 int main()
14 {
15     int a, b, c, validInput;
16
17     do
18     {
19         printf("Enter three integers: ");
20         validInput = scanf("%d %d %d", &a, &b, &c);
21
22         if (validInput != 3)
23         {
24             printf("\nInvalid input. Please enter three integers.\n");
25             while (getchar() != '\n')
26                 ;
27         }
28     } while (validInput != 3);
29
30     if (a > b && a > c)
31         printf("The largest number is: %d\n", a);
32     else if (b > a && b > c)
33         printf("The largest number is: %d\n", b);
34     else
35         printf("The largest number is: %d\n", c);
36     system("pause");
37     return 0;
38 }
39 }
```

Output:

```
C:\Users\adhik\Desktop\C Prc X + v
Enter three integers: 56 jh 47
Invalid input. Please enter three integers.
Enter three integers: 56 89 102
The largest number is: 102
Press any key to continue . . .
```

2.8 Calculate the Root of a Quadratic Equation

Explanation:

- ❖ The program computes the roots of a quadratic equation based on the discriminant value.

Code:

```
1  /*
2     Author: Abhishek Adhikari
3     Date: 10th August 2024
4     Topic: Roots of a Quadratic Equation
5     Purpose: Calculate the roots of a quadratic equation.
6     Formula:  $ax^2 + bx + c = 0$ 
7
8     Additional: The program will keep asking for input until valid integers are entered.
9  */
10
11 #include <stdio.h>
12 #include <math.h>
13 #include <stdlib.h>
14 int main()
15 {
16     int a, b, c, validInput;
17     float discriminant, root1, root2;
18
19     do
20     {
21         printf("Enter coefficients a, b, and c: ");
22         validInput = scanf("%d %d %d", &a, &b, &c);
23
24         if (validInput != 3)
25         {
26             printf("\n033[1;31mInvalid input. Please enter three integers.\033[0m\n\n");
27             while (getchar() != '\n')
28                 ;
29         }
30     } while (validInput != 3);
31
32     discriminant = b * b - 4 * a * c;
33
34     if (discriminant > 0)
35     {
36         root1 = (-b + sqrt(discriminant)) / (2 * a);
37         root2 = (-b - sqrt(discriminant)) / (2 * a);
38         printf("Roots are real and different: %.2f and %.2f\n\n", root1, root2);
39     }
40     else if (discriminant == 0)
41     {
42         root1 = root2 = -b / (2 * a);
43         printf("Roots are real and the same: %.2f and %.2f\n\n", root1, root2);
44     }
45     else
46     {
47         float realPart = -b / (2 * a);
48         float imaginaryPart = sqrt(-discriminant) / (2 * a);
49         printf("Roots are complex and different: %.2f + %.2fi and %.2f - %.2fi\n\n", realPart, imaginaryPart, realPart, imaginaryPart);
50     }
51     system("pause");
52     return 0;
53 }
54
```

Output:

```
C:\Users\adhik\Desktop\C Prc X + v
Enter coefficients a, b, and c: 12 g g
Invalid input. Please enter three integers.
Enter coefficients a, b, and c: 12 5 78
Roots are complex and different: 0.00 + 2.54i and 0.00 - 2.54i
Press any key to continue . . . |
```

2.9 Calculate Total, Percentage, and Division

Explanation:

- ❖ The program calculates total marks, percentage, and division based on user input.

Code:

```
1  /*
2  Author: Abhishek Adhikari
3  Date: 10th August 2024
4  Topic: Student Marks and Division
5  Purpose: Read roll no, name, and marks of three subjects and calculate the total, percentage, and division.
6  Hint: total = subject1 + subject2 + subject3; percentage = (total/300)*100;
7
8  Additional: The program will keep asking for valid input until proper values are entered.
9  */
10
11 #include <stdio.h>
12 #include <stdlib.h>
13 int main()
14 {
15     int rollNo, subject1, subject2, subject3, total, validInput;
16     char name[50];
17     float percentage;
18
19     printf("Enter Roll No: ");
20     scanf("%d", &rollNo);
21
22     printf("Enter Name: ");
23     scanf("%s", name);
24
25     do
26     {
27         printf("Enter marks of three subjects: ");
28         validInput = scanf("%d %d %d", &subject1, &subject2, &subject3);
29
30         if (validInput != 3)
31         {
32             printf("\n033[1;31mInvalid input. Please enter three integers.\033[0m\n\n");
33             while (getchar() != '\n')
34                 ;
35         }
36     } while (validInput != 3);
37
38     total = subject1 + subject2 + subject3;
39     percentage = (total / 300.0) * 100;
40
41     printf("Total: %d\n\n", total);
42     printf("Percentage: %.2f%%\n\n", percentage);
43
44     if (percentage >= 60)
45         printf("Division: First\n\n");
46     else if (percentage >= 50)
47         printf("Division: Second\n\n");
48     else if (percentage >= 40)
49         printf("Division: Third\n\n");
50     else
51         printf("Division: Fail\n\n");
52     system("pause");
53     return 0;
54 }
55 }
```

Output:

```
C:\Users\adhik\Desktop\C Prc X + v
Enter Roll No: 21
Enter Name: Abhishek
Enter marks of three subjects: d 54 t
Invalid input. Please enter three integers.
Enter marks of three subjects: 45 86 92
Total: 223
Percentage: 74.33%
Division: First
Press any key to continue . . . |
```

2.10 Temperature Categorization

Explanation:

- ❖ The program evaluates the temperature and prints a suitable weather message.

Code:

```
1  /*
2     Author: Abhishek Adhikari
3     Date: 10th August 2024
4     Topic: Temperature Message
5     Purpose: Display a suitable message according to the temperature in centigrade.
6     Hint: Temp < 0 then Freezing weather; Temp 0-10 then Very Cold weather; etc.
7
8     Additional: The program will keep asking for input until a valid integer is entered.
9  */
10
11 #include <stdio.h>
12 #include <stdlib.h>
13 int main()
14 {
15     int temperature, validInput;
16
17     do
18     {
19         printf("Enter temperature in centigrade: ");
20         validInput = scanf("%d", &temperature);
21
22         if (validInput != 1)
23         {
24             printf("\n\033[1;31mInvalid input. Please enter an integer.\033[0m\n\n");
25             while (getchar() != '\n')
26                 ;
27         }
28     } while (validInput != 1);
29
30     if (temperature < 0)
31         printf("Freezing weather.\n\n");
32     else if (temperature >= 0 && temperature < 10)
33         printf("Very Cold weather.\n\n");
34     else if (temperature >= 10 && temperature < 20)
35         printf("Cold weather.\n\n");
36     else if (temperature >= 20 && temperature < 30)
37         printf("Normal in Temperature.\n\n");
38     else if (temperature >= 30 && temperature < 40)
39         printf("It's Hot.\n\n");
40     else
41         printf("It's Very Hot.\n\n");
42     system("pause");
43     return 0;
44 }
45
```

Output:

```
C:\Users\adhik\Desktop\C Prc x + v
Enter temperature in centigrade: 25
Normal in Temperature.

Press any key to continue . . .
```

2.11 Check Triangle Type

Explanation:

- ❖ The program categorizes the triangle based on its side lengths.

Code:

```
1  /*
2     Author: Abhishek Adhikari
3     Date: 10th August 2024
4     Topic: Triangle Type Check
5     Purpose: Determine if a triangle is equilateral, isosceles, or scalene.
6     Hint: Compare the three sides of the triangle.
7
8     Additional: The program will keep asking for input until three valid integers are entered.
9  */
10
11 #include <stdio.h>
12 #include <stdlib.h>
13 int main()
14 {
15     int side1, side2, side3, validInput;
16
17     do
18     {
19         printf("Enter the three sides of the triangle: ");
20         validInput = scanf("%d %d %d", &side1, &side2, &side3);
21
22         if (validInput != 3)
23         {
24             printf("\nInvalid input. Please enter three integers.");
25             while (getchar() != '\n')
26                 ;
27         }
28     } while (validInput != 3);
29
30     if (side1 == side2 && side2 == side3)
31         printf("The triangle is Equilateral.\n");
32     else if (side1 == side2 || side2 == side3 || side1 == side3)
33         printf("The triangle is Isosceles.\n");
34     else
35         printf("The triangle is Scalene.\n");
36     system("pause");
37     return 0;
38 }
39 }
```

Output:

```
C:\Users\adhik\Desktop\C Prc X + v
Enter the three sides of the triangle: 45 c 65
Invalid input. Please enter three integers.
Enter the three sides of the triangle: 45 90 65
The triangle is Scalene.
Press any key to continue . . .
```

2.12 Check if a Triangle Can be Formed

Explanation:

- ❖ The program checks if the sum of the three angles equals 180 degrees to validate the triangle.

Code:

```
1  /*
2     Author: Abhishek Adhikari
3     Date: 10th August 2024
4     Topic: Triangle Formation Check
5     Purpose: Check whether a triangle can be formed by the given angles.
6     Hint: Sum of angles = 180 degrees.
7
8     Additional: The program will keep asking for input until three valid integers are entered.
9  */
10
11 #include <stdio.h>
12 #include <stdlib.h>
13 int main()
14 {
15     int angle1, angle2, angle3, validInput;
16
17     do
18     {
19         printf("Enter the three angles of the triangle: ");
20         validInput = scanf("%d %d %d", &angle1, &angle2, &angle3);
21
22         if (validInput != 3)
23         {
24             printf("\n\nInvalid input. Please enter three integers.\n\n");
25             while (getchar() != '\n')
26                 ;
27         }
28     } while (validInput != 3);
29
30     if (angle1 + angle2 + angle3 == 180)
31         printf("The angles can form a triangle.\n\n");
32     else
33         printf("The angles cannot form a triangle.\n\n");
34     system("pause");
35     return 0;
36 }
37 }
```


Output:

```
C:\Users\adhik\Desktop\C Prc X + v
Enter the three angles of the triangle: 45 sd 89
Invalid input. Please enter three integers.
Enter the three angles of the triangle: 45 45 90
The angles can form a triangle.
Press any key to continue . . . |
```

2.13 Check if a Character is an Alphabet, Digit, or Special Character

Explanation:

- ❖ The program uses standard library functions to classify the character.

Code:

```
1  /*
2     Author: Abhishek Adhikari
3     Date: 10th August 2024
4     Topic: Character Type Check
5     Purpose: Check whether a character is an alphabet, digit, or special character.
6     Hint: Use ASCII values to determine character type.
7
8     Additional: The program will keep asking for input until a valid character is entered.
9  */
10
11 #include <stdio.h>
12 #include <stdlib.h>
13 int main()
14 {
15     char ch;
16     int validInput;
17
18     do
19     {
20         printf("Enter a character: ");
21         validInput = scanf(" %c", &ch);
22
23         if (validInput != 1)
24         {
25             printf("\n033[1;31mInvalid input. Please enter a single character.\033[0m\n\n");
26             while (getchar() != '\n')
27                 ;
28         }
29
30     } while (validInput != 1);
31
32     if ((ch >= 'A' && ch <= 'Z') || (ch >= 'a' && ch <= 'z'))
33         printf("The character is an Alphabet.\n\n");
34     else if (ch >= '0' && ch <= '9')
35         printf("The character is a Digit.\n\n");
36     else
37         printf("The character is a Special Character.\n\n");
38     system("pause");
39     return 0;
40 }
```

Output:

```
C:\Users\adhik\Desktop\C Prc x + v
Enter a character: %
The character is a Special Character.
Press any key to continue . . . |
```

2.14 Check if an Alphabet is a Vowel or Consonant

Explanation:

- ❖ The program determines if the alphabet is a vowel or consonant.

Code:

```
1  /*
2   Author: Abhishek Adhikari
3   Date: 10th August 2024
4   Topic: Vowel or Consonant
5   Purpose: Check whether an alphabet is a vowel or consonant.
6   Hint: Vowels are 'a', 'e', 'i', 'o', 'u'.
7
8   Additional: The program will keep asking for input until a valid alphabet is entered.
9  */
10
11 #include <stdio.h>
12 #include <ctype.h>
13 #include <stdlib.h>
14 int main()
15 {
16     char ch;
17     int validInput;
18
19     do
20     {
21         printf("Enter an alphabet: ");
22         validInput = scanf(" %c", &ch);
23
24         if (validInput != 1 || !((ch >= 'A' && ch <= 'Z') || (ch >= 'a' && ch <= 'z'))))
25         {
26             printf("\nInvalid input. Please enter a single alphabet.\n");
27             while (getchar() != '\n')
28                 ;
29         }
30
31     } while (validInput != 1 || !((ch >= 'A' && ch <= 'Z') || (ch >= 'a' && ch <= 'z')));
32
33     ch = tolower(ch);
34     if (ch == 'a' || ch == 'e' || ch == 'i' || ch == 'o' || ch == 'u')
35         printf("The alphabet is a Vowel.\n");
36     else
37         printf("The alphabet is a Consonant.\n");
38     system("pause");
39     return 0;
40 }
```

Output:

```
C:\Users\adhik\Desktop\C Prc X + v
Enter an alphabet: 56
Invalid input. Please enter a single alphabet.
Enter an alphabet: i
The alphabet is a Vowel.
Press any key to continue . . . |
```

2.15 Check Character Type (Uppercase, Lowercase, Digit, Special Symbol)

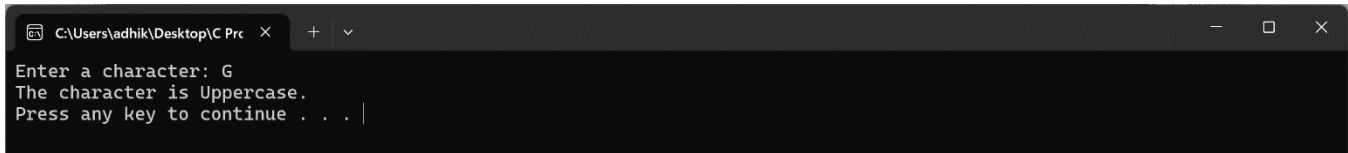
Explanation:

- ❖ The program classifies the character based on its type.

Code:

```
1  /*
2   Author: Abhishek Adhikari
3   Date: 10th August 2024
4   Topic: Character Type Check
5   Purpose: Check if a character is uppercase, lowercase, digit, or special symbol.
6   Hint: Use ASCII values to determine the type.
7
8   Additional: The program will keep asking for input until a valid character is entered.
9  */
10
11 #include <stdio.h>
12 #include <stdlib.h>
13 int main()
14 {
15     char ch;
16     int validInput;
17
18     do
19     {
20         printf("Enter a character: ");
21         validInput = scanf(" %c", &ch);
22
23         if (validInput != 1)
24         {
25             printf("\n\033[1;31mInvalid input. Please enter a single character.\033[0m\n\n");
26             while (getchar() != '\n')
27                 ;
28         }
29     } while (validInput != 1);
30
31     if (ch >= 'A' && ch <= 'Z')
32         printf("The character is Uppercase.\n");
33     else if (ch >= 'a' && ch <= 'z')
34         printf("The character is Lowercase.\n");
35     else if (ch >= '0' && ch <= '9')
36         printf("The character is a Digit.\n");
37     else
38         printf("The character is a Special Symbol.\n");
39     system("pause");
40     return 0;
41 }
42 }
```

Output:



```
C:\Users\adhik\Desktop\C Prc
Enter a character: G
The character is Uppercase.
Press any key to continue . . . |
```

3. Conclusion

This document provides a detailed overview of the various C programming exercises, including explanations, code, and instructions for each program. Please refer to the screenshots provided to see the programs in action.

4. References

C Programming Language - K&R

- *Authors:* Brian W. Kernighan and Dennis M. Ritchie
- *Description:* A seminal book on C programming, providing foundational knowledge and in-depth explanations of C syntax and features.
- *Link:* [The C Programming Language](#)

GNU C Library Documentation

- *Description:* Official documentation for the GNU C Library, providing detailed information on C standard library functions and their usage.
- *Link:* [GNU C Library Documentation](#)

GeeksforGeeks: C Programming Language

- *Description:* A comprehensive collection of articles, tutorials, and coding examples for learning C programming concepts and solving problems.
- *Link:* [GeeksforGeeks C Programming](#)