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Module 2

[Q_1] Research and provide three real-world applications where C programming is extensively used, such as in embedded systems, operating systems, or game development.

- **Embedded System**
  - Embedded System, It allow Low-Level access to memory and hardware.
  - It's found in devices like Microcontrollers, automobiles, medical devices, consumer electronics etc.

  Example:

  - Smart Home Application
- **Operating System**
  - C is backbone of many operating system because it offers a good balance between low-level system access and portability.
  - Its include kernel development, system libraries and utilities.

  Example:

  - Linux Kernel
  - Window System Component
- **Game Development**
  - **C is still a critical language in game development. Especially in creation of game engines and in performance critical component.**

  Example:

  - Game Engines
  - Graphics & Rendering

[Q_2] Install a C compiler on your system and configure the IDE. Write your first program to print "Hello, World!" and run it.

```
#include<stdio.h>
int main()
{
   printf("Hello World");
   return 0;
}
```

OUTPUT :---

Hello World

[Q_3] Write a C program that includes variables, constants, and comments. Declare and use different data types (int, char, float) and display their values.

```
#include <stdio.h>
int main()
{
   int n1;
   printf("Enter Intger The Numerical Value Of N1:\t");
   scanf("%d", &n1);
   printf("The Intger Numerical Value Of N1 Is: %d", n1);
   printf("\n");
   float n2;
   printf("\nEnter Float The Numerical Value Of N2:\t");
   scanf("%f", &n2);
   printf("The Float Numerical Value Of N2 Is: %.2f", n2);
   printf("\n");
   char c = 'A';
   printf("\nThe Character  Of c Is: %c", c);

   return 0;
}
```

OUTPUT:-

```
Enter Intger The Numerical Value Of N1: 20
The Intger Numerical Value Of N1 Is: 20
Enter Float The Numerical Value Of N2:  143.13
The Float Numerical Value Of N2 Is: 143.13
The Character  Of c Is: A
```

[Q_4] Write a C program that accepts two integers from the user and performs arithmetic, relational, and logical operations on them. Display the results.

```
#include <stdio.h>
int main()
{
   int n1, n2;
   printf("Enter The Numerical Value Of N1:\t");
   scanf("%d", &n1);
   printf("Enter The Numerical Value Of N2:\t");
   scanf("%d", &n2);

   printf("\n------------------------");
   // Arethmatic Operaters
   printf("\nArithmeric Operaters");
   printf("\nThe Addition Of  %d and  %d is : %d", n1, n2, n1 + n2);
   printf("\nThe Subtraction Of  %d and  %d is : %d", n1, n2, n1 - n2);
   printf("\nThe Multiplication Of  %d and  %d is : %d", n1, n2, n1 * n2);
   printf("\nThe Division Of  %d and  %d is : %d", n1, n2, n1 / n2);
   printf("\nThe Modulo Of  %d and  %d is : %d", n1, n2, n1 % n2);

   printf("\n------------------------");
   // Relational Operaters
   printf("\nRelational Operaters");
   printf("\nThe Eqale Relational Operaters Of  %d ==  %d : %s ", n1, n2, (n1
== n2) ? "True" : "False");
   printf("\nThe Not Eqale Relational Operaters Of Of  %d !=  %d : %s ", n1,
n2, (n1 != n2) ? "True" : "False");
```

```
    printf("\nThe Greater Than Relational Operaters Of Of  %d >  %d: %s ", n1, n2, (n1 > n2) ? "True" : "False");

    printf("\nThe Less Than Relational Operaters Of Of  %d <  %d : %s ", n1, n2, (n1 < n2) ? "True" : "False");


    printf("\n------------------------");

    // Logical Operaters

    printf("\nLogical Operaters");

    printf("\nThe && Logical Operaters Of  %d > 0 &&  %d> 0 : %s ", n1, n2, (n1 > 0 && n2 > 0) ? "True" : "False");

    printf("\nThe || Eqale Logical Operaters Of Of  %d > 0 ||  %d > 0 : %s", n1, n2, (n1 > 0 || n2 > 0) ? "True" : "False");

    // printf("\nThe ! Logical Operaters Of Of  %d > 0 ! %d > 0 %s ", n1, n2, (n1>0 ! n2>0) ? "True" : "False");


    return 0;

}
```

OUTPUT :

```
Enter The Numerical Value Of N1:        10

Enter The Numerical Value Of N2:        5


------------------------

Arithmeric Operaters

The Addition Of  10 and  5 is : 15

The Subtraction Of  10 and  5 is : 5

The Multiplication Of  10 and  5 is : 50

The Division Of  10 and  5 is : 2

The Modulo Of  10 and  5 is : 0

------------------------
```

Relational Operaters

The Eqale Relational Operaters Of 10 == 5 : False

The Not Eqale Relational Operaters Of Of 10 != 5 : True

The Greater Than Relational Operaters Of Of 10 > 5: True

The Less Than Relational Operaters Of Of 10 < 5 : False

Logical Operaters

The && Logical Operaters Of 10 > 0 && 5> 0 : True

The || Eqale Logical Operaters Of Of 10 > 0 || 5 > 0 : True

[Q_5] Write a C program to check if a number is even or odd using an if-else statement. Extend the program using a switch statement to display the month name based on the user's input (1 for January, 2 for February, etc.).

```
#include <stdio.h>
int main()
{
   int n1,ch;
   printf("\nOdd OR Even Number Display");
   printf("\nEnter The Numerical Value Of N1:\t");
   scanf("%d", &n1);

   printf("\n--------");
   if (n1 % 2 == 0)
   {
      printf("\n%d Is Even Number.", n1);
   }
   else
   {
      printf("\n%d Is Odd Number.", n1);
   }

   printf("\n--------");
   printf("\nUsing Swtich Case Statement Dispaly The Month");
   printf("\nEnter 1 for January");
   printf("\nEnter 2 for February");
   printf("\nEnter 3 for March");
   printf("\nEnter 4 for April");
```

```
printf("\nEnter 5 for May");
printf("\nEnter 6 for June");
printf("\nEnter 7 for July");
printf("\nEnter 8 for August");
printf("\nEnter 9 for September");
printf("\nEnter 10 for October");
printf("\nEnter 11 for November");
printf("\nEnter 12 for December");
printf("\n\n");
printf("Enter Your Choice:");
scanf("%d",&ch);

switch (ch)
{
case 1:
   printf("January");
   break;

case 2:
   printf("ebruary");
   break;
case 3:
   printf("March");
   break;
case 4:
   printf("April");
   break;
```

```
case 5:
   printf("May");
   break;
case 6:
   printf("June");
   break;
case 7:
   printf("July");
   break;
case 8:
   printf("August");
   break;
case 9:
   printf("September");
   break;
case 10:
   printf("October");
   break;
case 11:
   printf("November");
   break;
case 12:
   printf("December");
   break;

default:
printf("Invaliud Choice...!");
```

```
        break;
    }
    return 0;
}
```

OUTPUT :

```
Odd OR Even Number Display
Enter The Numerical Value Of N1:        12


--------
12 Is Even Number.
--------
Using Swtich Case Statement Dispaly The Month
Enter 1 for January
Enter 2 for February
Enter 3 for March
Enter 4 for April
Enter 5 for May
Enter 6 for June
Enter 7 for July
Enter 8 for August
Enter 9 for September
Enter 10 for October
Enter 11 for November
Enter 12 for December

Enter Your Choice:9
September
```

[Q_6] Write a C program to print numbers from 1 to 10 using all three types of loops (while, for, do-while).

```
#include <stdio.h>
int main()
{
   int i;
   printf("Using For Loop Print The 1 - 10 Numerical Value:");
   for (i = 1; i <= 10; i++)
   {
      printf("\n%d", i);
   }

   printf("\n-----------------------------------------------------------");
   printf("\nUsing While Loop Print The 1 - 10 Numerical Value:");
   i = 1;
   while (i <= 10)
   {
      printf("\n%d", i);
      i++;
   }

   printf("\n-----------------------------------------------------------");
   printf("\nUsing Do-While Loop Print The 1 - 10 Numerical Value:");
   i = 1;
   do
   {
      printf("\n%d", i);
```

```
        i++;
    } while (i <= 10);

    return 0;
}
```

OUTPUT :

```
Using For Loop Print The 1 - 10 Numerical Value:
1
2
3
4
5
6
7
8
9
10
------------------------------------------------------------
Using While Loop Print The 1 - 10 Numerical Value:
1
2
3
4
5
6
7
8
```

9

10

Using Do-While Loop Print The 1 - 10 Numerical Value:

1

2

3

4

5

6

7

8

9

10

[Q_7] Write a C program that uses the break statement to stop printing numbers when it reaches 5. Modify the program to skip printing the number 3 using the continue statement.

```
#include <stdio.h>
int main()
{
   int n1, i;
   printf("Enter The Numerical Value Of N1:\t");
   scanf("%d", &n1);

   for (i = 1; i <= n1; i++)
   {
      if (i == 3)
      {
         continue;
      }
      printf("\n%d", i);
      if (i == 5)
      {
         break;
      }
   }

   return 0;
}
```

OUTPUT :

```
Enter The Numerical Value Of N1:        10
```

1

2

4

5

[Q_8] Write a C program that calculates the factorial of a number using a function. Include function declaration, definition, and call.

```
#include <stdio.h>
int fact(int n1)
{
   int i, f = 1;
   for (i = 1; i <= n1; i++)
   {
      f = f * i;
   }

   return f;
}
int main()
{
   int n1, ans;
   printf("Enter Your Numerical Value For N1:\t");
   scanf("%d", &n1);

   ans = fact(n1);
   printf("\n %d Factorial Number Is: %d", n1, ans);
   return 0;
}
```

OUTPUT :

```
Enter Your Numerical Value For N1:      6

 6 Factorial Number Is: 720
```

[Q_9] Write a C program that stores 5 integers in a one-dimensional array and prints them. Extend this to handle a two-dimensional array (3x3 matrix) and calculate the sum of all elements.

```
#include <stdio.h>
int main()
{
   // One Dimentional Array
   int a[100], i,b[100][100], c[100][100], size, sum[100][100], j, h, v;
   for (i = 0; i < 5; i++)
   {
      printf("Enter The Array Of An Elements a[%d]:\t", i);
      scanf("%d", &a[i]);
   }
   printf("\n\nElements An Array of a is:");
   for (i = 0; i < 5; i++)
   {
      printf("\n%d", a[i]);
   }

   // Two Dimentional Array
   printf("\n----------------------------------------");

   printf("\nEnter Row Number:\t");
   scanf("%d", &v);
   printf("\nEnter Col Number:\t");
   scanf("%d", &h);
   printf("\nEnter The Array Of An Size :\t");
```

```
scanf("%d", &size);
printf("\n");
for (i = 0; i < size; i++)
{
   for (j = 0; j < size; j++)
   {
      printf("\nEnter The Array Of An Elements b[%d][%d]:\t", i, j);
      scanf("%d", &b[i][j]);
   }
}
printf("\n");
for (i = 0; i < size; i++)
{
   for (j = 0; j < size; j++)
   {
      printf("\nEnter The Array Of An Elements c[%d][%d]:\t", i, j);
      scanf("%d", &c[i][j]);
   }
}

printf("\n\n");
printf("\nElements Of An Array   B:");
for (i = 0; i < size; i++)
{
   for (j = 0; j < size; j++)
   {
      printf(" %d ", b[i][j]);
```

```
    }
    printf("\n");
}
printf("\n");
printf("\nElements Of An Array   C:");
for (i = 0; i < size; i++)
{
    for (j = 0; j < size; j++)
    {
        printf(" %d ", c[i][j]);
    }
    printf("\n");
}

printf("\n\n");
printf("\nThe Sum Of Array Elements B & C Is:");
for (i = 0; i < size; i++)
{
    for (j = 0; j < size; j++)
    {
        sum[i][j] = b[i][j] + b[i][j];
        printf(" %d ", sum[i][j]);
    }
    printf("\n");
}

return 0;
```

}

OUTPUT :

Enter The Array Of An Elements a[0]: 1

Enter The Array Of An Elements a[1]: 2

Enter The Array Of An Elements a[2]: 3

Enter The Array Of An Elements a[3]: 4

Enter The Array Of An Elements a[4]: 5

Elements An Array of a is:

1

2

3

4

5

Enter Row Number: 3

Enter Col Number: 3

Enter The Array Of An Size : 3

Enter The Array Of An Elements b[0][0]: 1

Enter The Array Of An Elements b[0][1]: 2

Enter The Array Of An Elements b[0][2]: 3

Enter The Array Of An Elements b[1][0]: 4

Enter The Array Of An Elements b[1][1]: 5

Enter The Array Of An Elements b[1][2]: 6

Enter The Array Of An Elements b[2][0]: 7

Enter The Array Of An Elements b[2][1]: 8

Enter The Array Of An Elements b[2][2]:9

Enter The Array Of An Elements c[0][0]: 1

Enter The Array Of An Elements c[0][1]: 2

Enter The Array Of An Elements c[0][2]: 3

Enter The Array Of An Elements c[1][0]: 4

Enter The Array Of An Elements c[1][1]: 5

Enter The Array Of An Elements c[1][2]: 6

Enter The Array Of An Elements c[2][0]: 7

Enter The Array Of An Elements c[2][1]: 8

Enter The Array Of An Elements c[2][2]: 9

Elements an Array Of B:

1 2 3

4 5 6

7 8 9

Elements an Array Of C:

1 2 3

4 5 6

7 8 9

The Sum Of Array Elements B & C Is:

2 4 6

8 10 12

14 16 18

[Q_10] Write a C program to demonstrate pointer usage. Use a pointer to modify the value of a variable and print the result.

[Q_11] Write a C program that takes two strings from the user and concatenates them using strcat(). Display the concatenated string and its length using strlen().

```
#include <stdio.h>
#include <string.h>
int main()
{
   char s1[100], s2[100], s3[200];
   printf("Enter Your First String Name:\t");
   gets(s1);
   printf("Enter Your Second String Name:\t");
   gets(s2);

   strcat(s1, s2);
   printf("\nThe String After Using strcat() is : %s ",s1);

   int len = strlen(s1);
   printf("\nThe Length Of strcat() String is %d ",len);
   return 0;
}
```

OUTPUT :

```
Enter Your First String Name:   Hello!
Enter Your Second String Name:  How Are You?

The String After Using strcat() is : Hello!How Are You?
The Length Of strcat() String is  18
```

[Q_12] Write a C program that defines a structure to store a student's details (name, roll number, and marks). Use an array of structures to store details of 3 students and print them.

[Q_13] Write a C program to create a file, write a string into it, close the file, then open the file again to read and display its contents.