**Module2 – Introduction to Programming Overview of C Programming**

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

**ANS =** Here are three real-world applications of C programming:

1. **Embedded Systems**: Used in devices like microwaves and car systems for efficient hardware control.
2. **Operating Systems**: Core language for OS like Linux and Windows to manage hardware and resources.
3. **Game Development**: Used in game engines and high-performance games for fast processing and smooth gameplay.
4. **Install a C compiler on your system and configure the IDE .Write your first program to print "Hello World! "and run it.**

**ANS =**

**#include <stdio.h>**

**int main()**

**{**

**printf("\nHello, World!");**

**return 0;**

**}**

**Output= Hello,world!**

1. **Write a C program that includes variables , constants , and comments .Declare and use different datatypes(int ,char ,float)and display their values.**

**ANS =**

**#include <stdio.h>**

**int main()**

**{**

**// Declare variables**

**int age = 25; // Integer variable**

**char grade = 'A'; // Character variable**

**float height = 5.8; // Float variable**

**// Declare a constant**

**const float PI = 3.14; // Constant value**

**// Display values**

**printf("\nAge = %d", age);**

**printf("\nGrade = %c", grade);**

**printf("\nHeight = %.2f", height);**

**printf("\nPI = %.2f", PI);**

**return 0;**

**}**

**Output : =**

**Age: 25**

**Grade: A**

**Height: 5.80**

**PI: 3.14**

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

**ANS =**

**#include <stdio.h>**

**int main()**

**{**

**int num1,num2;**

**printf("\nEnter the number 1= ");**

**scanf("%d",&num1);**

**printf("\nEnter the number 2= ");**

**scanf("%d",&num2);**

**// Arithmetic operations**

**printf("\nArithmetic Operations:\n");**

**printf("\n%d + %d = %d",num1,num2,num1+num2);**

**printf("\n%d - %d = %d",num1,num2,num1-num2);**

**printf("\n%d \* %d = %d",num1,num2,num1\*num2);**

**printf("\n%d / %d = %.2f",num1,num2,(float)num1/(float)num2);**

**printf("\n%d %% %d = %d\n",num1,num2,num1%num2);**

**// Relational operations**

**printf("\nRelational Operations :\n");**

**printf("\n%d > %d = %d", num1, num2, num1 > num2);**

**printf("\n%d < %d = %d", num1, num2, num1 < num2);**

**printf("\n%d == %d = %d", num1, num2, num1 == num2);**

**printf("\n%d != %d = %d", num1, num2, num1 != num2);**

**printf("\n%d >= %d = %d", num1, num2, num1 >= num2);**

**printf("\n%d <= %d = %d\n", num1, num2, num1 <= num2);**

**// Logical operations**

**printf("\nLogical Operations :\n");**

**printf("(%d > 0) && (%d > 0) = %d\n", num1, num2, (num1 > 0) && (num2 > 0));**

**printf("(%d > 0) || (%d > 0) = %d\n", num1, num2, (num1 > 0) || (num2 > 0));**

**printf("!(%d > 0) = %d\n", num1, !(num1 > 0));**

**printf("!(%d > 0) = %d\n", num2, !(num2 > 0));**

**return 0;**

**}**

**Output =**

**Enter the number 1= 10**

**Enter the number 2= 5**

**Arithmetic Operations:**

**10 + 5 = 15**

**10 - 5 = 5**

**10 \* 5 = 50**

**10 / 5 = 2.00**

**10 % 5 = 0**

**Relational Operations :**

**10 > 5 = 1**

**10 < 5 = 0**

**10 == 5 = 0**

**10 != 5 = 1**

**10 >= 5 = 1**

**10 <= 5 = 0**

**Logical Operations :**

**(10 > 0) && (5 > 0) = 1**

**(10 > 0) || (5 > 0) = 1**

**!(10 > 0) = 0**

**!(5 > 0) = 0**

**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(1forJanuary,2forFebruary,etc.)**

**ANS=**

**#include<stdio.h>**

**int main()**

**{**

**int num;**

**printf("\nenter the number =");**

**scanf("%d",&num);**

**if(num%2==0)**

**{**

**printf("\nthe number %d is even\n",num);**

**}**

**else**

**{**

**printf("\nthe number %d is odd\n",num);**

**}**

**int choice;**

**printf("\nenter the month (1-12)=");**

**scanf("%d",&choice);**

**switch (choice)**

**{**

**case 1:**

**printf("\n1 for januray");**

**break;**

**case 2:**

**printf("\n2 for febuary");**

**break;**

**case 3:**

**printf("\n3 for march");**

**break;**

**case 4:**

**printf("\n4 for april");**

**break;**

**case 5:**

**printf("\n5 for may");**

**break;**

**case 6:**

**printf("\n6 for june");**

**break;**

**case 7:**

**printf("\n7 for july");**

**break;**

**case 8:**

**printf("\n8 for auguest");**

**break;**

**case 9:**

**printf("\n9 for septmber");**

**break;**

**case 10:**

**printf("\n10 for october");**

**break;**

**case 11:**

**printf("\n11 for november");**

**break;**

**case 12:**

**printf("\n12 for december");**

**break;**

**default: printf("\nInvalid month number");**

**}**

**return 0;**

**}**

**Output =**

**Example :**

**//User enter 10 and 4**

**enter the number =10**

**the number 10 is even**

**enter the month (1-12)=4**

**4 for april**

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

**ANS=**

**#include<stdio.h>**

**int main ()**

**{**

**int i,k,r;**

**printf("\nfor loop=\n");**

**for(i=1;i<=10;i++)**

**{**

**printf("\t%d",i);**

**}**

**printf("\nwhile loop=\n");**

**k=1;**

**while(k<=10)**

**{**

**printf("\t%d",k);**

**k++;**

**}**

**printf("\ndo while loop=\n");**

**r=1;**

**do**

**{**

**printf("\t%d",r);**

**r++;**

**} while (r<=10);**

**return 0;**

**}**

**Output =**

**for loop=**

**1 2 3 4 5 6 7 8 9 10**

**while loop=**

**1 2 3 4 5 6 7 8 9 10**

**do while loop=**

**1 2 3 4 5 6 7 8 9 10**

**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.**

**=>**

**Using break statement :**

**#include<stdio.h>**

**int main ()**

**{**

**int i;**

**for(i=0;i<=10;i++)**

**{**

**if(i==5)**

**{**

**break;**

**}**

**printf("\n%d",i);**

**}**

**return 0;**

**}**

**Output =**

**0**

**1**

**2**

**3**

**4**

**2.Using continue statement:**

**#include<stdio.h>**

**int main ()**

**{**

**int i;**

**for(i=0;i<=5;i++)**

**{**

**if(i==3)**

**{**

**continue;**

**}**

**printf("\n%d",i);**

**}**

**return 0;**

**}**

**Output :**

**0**

**1**

**2**

**4**

**5**

**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 num); //function declaration**

**int fact(int num) //function defination**

**{ int i,fact=1;**

**for(i=1;i<=num;i++)**

**{**

**fact=fact\*i;**

**}**

**return fact;**

**}**

**int main ()**

**{**

**int num;**

**printf("\nenter the number :");**

**scanf("%d",&num);**

**int result=fact(num); // function calling**

**printf("\nThe factorial of %d is %d",num,result);**

**return 0;**

**}**

**Output =**

**enter the number : 5**

**The factorial of 5 is 120**

**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(3x3matrix)and calculate the sum of all elements.**

**=>**

**#include<stdio.h>**

**int main ()**

**{**

**int a[5],i;**

**for(i=0;i<5;i++)**

**{**

**printf("\nenter the element of a[%d] =",i);**

**scanf("%d",&a[i]);**

**}**

**printf("\nArray of =");**

**for(i=0;i<5;i++)**

**{**

**printf(" %d",a[i]);**

**}**

**printf("\n");**

**int arr[3][3],k,j;**

**for(k=0;k<3;k++)**

**{**

**for(j=0;j<3;j++)**

**{**

**printf("\nenter the element of arr[%d][%d]=",k,j);**

**scanf("%d",&arr[k][j]);**

**}**

**}**

**printf("\nArray of Matrix=\n");**

**for(k=0;k<3;k++)**

**{**

**for(j=0;j<3;j++)**

**{**

**printf("%d ",arr[k][j]);**

**}**

**printf("\n");**

**}**

**return 0;**

**}**

**Output =**

**Array of = 1 2 1 2 1**

**Array of Matrix=**

**1 2 3**

**4 5 6**

**7 8 9**

**10.** **Write a C program to demonstrate pointer usage .Use a pointer to modify the value of a variable and print the result.**

**=>**

**#include <stdio.h>**

**int main()**

**{**

**int num = 10;**

**int \*ptr; // Declare a pointer**

**printf("\nOriginal value of num : %d\n",num);**

**ptr = &num;**

**\*ptr = 20;**

**printf("Modified value of num using pointer: %d\n", num);**

**return 0;**

**}**

**Output=**

**Original value of num: 10**

**Modified value of num using pointer: 20**

**11.** **Write a C program that takes two strings from the user and concatenates them using strcat() .Display the concatenated string and its leng thusing strlen()**

**=>**

**#include<stdio.h>**

**int main()**

**{**

**char str1[100],str2[100];**

**printf("\nEnter the value in str1 = ");**

**gets(str1);**

**printf("\nEnter the value in str2 = ");**

**gets(str2);**

**printf("\n\nOriginal value of str1 = %s",str1);**

**printf("\n\nOriginal value of str2 = %s",str2);**

**strcat(str1,str2);**

**printf("\n\nValue of str1 after concatination = %s",str1);**

**printf("\n\nlength of concatination = %d",strlen(str1));**

**return 0;**

**}**

**Output =**

**Enter the value in str1 = Hello**

**Enter the value in str2 = world**

**Original value of str1 = Hello**

**Original value of str2 = world**

**Value of str1 after concatination = Helloworld**

**length of concatination = 10**

**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.**

**=>**

**#include <stdio.h>**

**struct Student**

**{**

**char name[100];**

**int rollNumber;**

**float marks;**

**};**

**int main()**

**{**

**struct Student s[3];**

**int i;**

**for(i=0;i<3;i++)**

**{**

**printf("\nEnter name for student %d: ",i+1);**

**scanf("%s",s[i].name);**

**printf("\nEnter roll number for student %d: ",i+1);**

**scanf("%d",&s[i].rollNumber);**

**printf("\nEnter marks for student %d: ", i+1);**

**scanf("%f",&s[i].marks);**

**}**

**for(i=0;i<3;i++)**

**{**

**printf("\nStudent = %d",i+1);**

**printf("\nName = %s",s[i].name);**

**printf("\nRoll Number = %d",s[i].rollNumber);**

**printf("\nMarks = %.2f",s[i].marks);**

**}**

**return 0;**

**}**

**Output=**

**Enter marks for student 1: 88**

**Enter name for student 2: harsh**

**Enter roll number for student 2: 102**

**Enter marks for student 2: 92**

**Enter name for student 3: khushi**

**Enter roll number for student 3: 103**

**Enter marks for student 3: 97**

**Student = 1**

**Name = ronak**

**Roll Number = 101**

**Marks = 88.00**

**Student = 2**

**Name = harsh**

**Roll Number = 102**

**Marks = 92.00**

**Student = 3**

**Name = khushi**

**Roll Number = 103**

**Marks = 97.00**

**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.**

**=>#include <stdio.h>**

**int main()**

**{**

**FILE \*file;**

**file = fopen("example.txt", "w");**

**if (file == NULL) {**

**printf("Error opening file.\n");**

**return 1;**

**}**

**fputs("Hello, World!", file);**

**fclose(file);**

**file = fopen("example.txt", "r");**

**if (file == NULL) {**

**printf("Error opening file.\n");**

**return 1;**

**}**

**char ch;**

**while ((ch = fgetc(file)) != EOF) {**

**putchar(ch);**

**}**

**fclose(file);**

**return 0;**

**}**

**Output=**

**Hello, World!**

**Extra Lab Exercises**

**1.Operators**

1. **Write a C program that acts as a simple calculator .The program should take two numbers and an operator as input from the user and perform the respective operation(addition, subtraction ,multiplication ,division ,or modulus) using operators.**

**=>**

**#include<stdio.h>**

**int main()**

**{**

**int num1,num2,ans;**

**//addition**

**printf("\nEnter the value of num1 = ");**

**scanf("%d",&num1);**

**printf("\nEnter the value of num2 = ");**

**scanf("%d",&num2);**

**ans = num1 + num2;**

**printf("\nThe addition of %d and %d is %d",num1,num2,ans);**

**//subtraction**

**printf("\nEnter the value of num1 = ");**

**scanf("%d",&num1);**

**printf("\nEnter the value of num2 = ");**

**scanf("%d",&num2);**

**ans = num1 - num2;**

**printf("\nThe subtraction of %d and %d is %d",num1,num2,ans);**

**//multiplication**

**printf("\nEnter the value of num1 = ");**

**scanf("%d",&num1);**

**printf("\nEnter the value of num2 = ");**

**scanf("%d",&num2);**

**ans = num1 \* num2;**

**printf("\nThe multiplication of %d and %d is %d",num1,num2,ans);**

**//division**

**printf("\nEnter the value of num1 = ");**

**scanf("%d",&num1);**

**printf("\nEnter the value of num2 = ");**

**scanf("%d",&num2);**

**printf("\nThe division of %d and %d is %f",num1,num2,(float)num1/(float)num2);**

**//remainder**

**printf("\nEnter the value of num1 = ");**

**scanf("%d",&num1);**

**printf("\nEnter the value of num2 = ");**

**scanf("%d",&num2);**

**printf("\nThe remainder of %d and %d is %d",num1,num2,num1%num2);**

**return 0;**

**}**

**2.**  **Write a C program that takes an integer from the user and checks the following using different operators:**

**🡪 Whether the number is even or odd.**

**=>**

**#include <stdio.h>**

**int main()**

**{**

**int num;**

**printf("Enter the number: ");**

**scanf("%d", &num);**

**if (num%2==0)**

**{**

**printf("\n%d is an even number.\n",num);**

**} else**

**{**

**printf("\n%d is an odd number",num);**

**}**

**return 0;**

**}**

**Output=**

**Enter the number: 20**

**20 is an even number.**

**🡪Whether the number is positive, negative, or zero.**

**#include <stdio.h>**

**int main()**

**{**

**int number;**

**printf("Enter the number:");**

**scanf("%d", &number);**

**if (number>0)**

**{**

**printf("\n%d is a positive number",number);**

**}**

**else if (number<0)**

**{**

**printf("\n%d is a negative number",number);**

**}**

**else**

**{**

**printf("\n%d is zero",number);**

**}**

**return 0;**

**}**

**Output =**

**Enter the number:-10**

**-10 is a negative number**

**🡪Whether the number is a multiple of both 3 and 5**

**=>**

**#include <stdio.h>**

**int main()**

**{**

**int number;**

**printf("Enter a number: ");**

**scanf("%d", &number);**

**if (number % 15 == 0)**

**{**

**printf("\n%d is a multiple of both 3 and 5", number);**

**} else {**

**printf("\n%d is not a multiple of both 3 and 5", number);**

**}**

**return 0;**

**}**

**Output=**

**Enter a number: 9**

**9 is not a multiple of both 3 and 5.**

**2.Control Statements**

**Write a C program that takes the marks of a student as input and displays the corresponding grade based on the following conditions.**

**=>**

**Using if-else**

**#include<stdio.h>**

**int main ()**

**{**

**int grade,marks;**

**printf("\nenter the marks:");**

**scanf("%d",&marks);**

**if(marks>90)**

**{**

**printf("\ngrade for A");**

**}**

**else if(marks>75 && marks<=90)**

**{**

**printf("\ngrade for B");**

**}**

**else if(marks>50 && marks<=75)**

**{**

**printf("\ngrade for C");**

**}**

**else**

**{**

**printf("\ngrade for D");**

**}**

**return 0;**

**}**

**Using Switch statement**

**#include<stdio.h>**

**int main ()**

**{**

**int grade;**

**float marks;**

**printf("\nenter the marks:");**

**scanf("%f",&marks);**

**if(marks>90)**

**{**

**grade=1;**

**}**

**else if(marks>75 && marks<=90)**

**{**

**grade=2;**

**}**

**else if(marks>50 && marks<=75)**

**{**

**grade=3;**

**}**

**else**

**{**

**grade=4;**

**}**

**switch(grade)**

**{**

**case 1:**

**printf("\ngrade for A");**

**break;**

**case 2:**

**printf("\ngrade for B");**

**break;**

**case 3:**

**printf("\ngrade for C");**

**break;**

**case 4:**

**printf("\ngrade for D");**

**break;**

**}**

**return 0;**

**}**

1. **Write a C program that takes three numbers from the user and determines.**

🡪**The largest number.**

**If-else :**

**#include <stdio.h>**

**int main()**

**{**

**int num1,num2,num3;**

**printf("Enter the number 1:");**

**scanf("%d",&num1);**

**printf("Enter the number 2:");**

**scanf("%d",&num2);**

**printf("Enter the number 3:");**

**scanf("%d",&num3);**

**if (num1>=num2 && num1>=num3)**

**{**

**printf("The largest number is: %d", num1);**

**}**

**else if (num2>=num1 && num2>=num3)**

**{**

**printf("The largest number is: %d", num2);**

**}**

**else**

**{**

**printf("The largest number is: %d", num3);**

**}**

**return 0;**

**}**

**Switch statement :**

**#include <stdio.h>**

**int main()**

**{**

**int num1,num2,num3,largest;**

**printf("Enter the number 1:");**

**scanf("%d",&num1);**

**printf("Enter the number 2:");**

**scanf("%d",&num2);**

**printf("Enter the number 3:");**

**scanf("%d",&num3);**

**if (num1>=num2 && num1>=num3)**

**{**

**largest=1;**

**}**

**else if (num2>=num1 && num2>=num3)**

**{**

**largest=2;**

**}**

**else**

**{**

**largest=3;**

**}**

**switch(largest)**

**{**

**case 1:**

**printf("\nLargest number: %d",num1);**

**break;**

**case 2:**

**printf("\nLargest number: %d",num2);**

**break;**

**case 3:**

**printf("Largest number:%d",num3);**

**break;**

**}**

**return 0;**

**}**

**🡪smallest number**

**Using if else**

**#include <stdio.h>**

**int main()**

**{**

**int num1,num2,num3,smallest;**

**printf("Enter the number 1:");**

**scanf("%d",&num1);**

**printf("Enter the number 2:");**

**scanf("%d",&num2);**

**printf("Enter the number 3:");**

**scanf("%d",&num3);**

**if (num1 <= num2 && num1 <= num3)**

**{**

**printf("Smallest number: %d\n",num1);**

**}**

**else if (num2 <= num1 && num2 <= num3)**

**{**

**printf("Smallest number: %d\n", num2);**

**}**

**else**

**{**

**printf("Smallest number: %d\n", num3);**

**}**

**return 0;**

**}**

**Using switch statement**

**#include <stdio.h>**

**int main()**

**{**

**int num1,num2,num3,smallest;**

**printf("Enter the number 1:");**

**scanf("%d",&num1);**

**printf("Enter the number 2:");**

**scanf("%d",&num2);**

**printf("Enter the number 3:");**

**scanf("%d",&num3);**

**if (num1 <= num2 && num1 <= num3)**

**{**

**smallest = 1;**

**}**

**else if (num2 <= num1 && num2 <= num3)**

**{**

**smallest = 2;**

**}**

**else**

**{**

**smallest = 3;**

**}**

**switch (smallest)**

**{**

**case 1:**

**printf("Smallest number: %d\n",num1);**

**break;**

**case 2:**

**printf("Smallest number: %d\n", num2);**

**break;**

**case 3:**

**printf("Smallest number: %d\n", num3);**

**break;**

**}**

**3.Loops**

1. **Write a C program that checks whether a given number is a prime number or not using a for loop**

**=>**

**#include <stdio.h>**

**int main()**

**{**

**int num,i,flag=0;**

**printf("Enter a number: ");**

**scanf("%d",&num);**

**i=2;**

**while(i<=num/2)**

**{**

**if(num%i==0)**

**{**

**flag=1;**

**}**

**i++;**

**}**

**if(flag==0)**

**{**

**printf("%d is a prime number.\n", num);**

**}**

**else**

**{**

**printf("%d is not a prime number.\n", num);**

**}**

**return 0;**

**}**

1. **Write a C program that takes an integer input from the user and prints its multiplication table using a for loop.**

**=>**

**#include <stdio.h>**

**int main()**

**{**

**int number,i;**

**printf("Enter the table of number:");**

**scanf("%d",&number);**

**printf("\nMultiplication table of %d",number);**

**for(i=1;i<=10;i++)**

**{**

**printf("\n%d x %d = %d\n",number,i,number\*i);**

**}**

**return 0;**

**}**

1. **Write a C program that takes an integer from the user and calculates the sum of its digits using a while loop.**

**=>**

**#include <stdio.h>**

**int main()**

**{**

**int num,sum = 0,digit;**

**printf("Enter the number: ");**

**scanf("%d",&num);**

**while (num!=0)**

**{**

**digit=num%10;**

**sum=sum+digit;**

**num=num/10;**

**}**

**printf("Sum of digits: %d\n",sum);**

**return 0;**

**}**

**Challenge**

**#include <stdio.h>**

**int main()**

**{**

**int num,sum = 0,digit,rev=0;**

**printf("Enter the number: ");**

**scanf("%d",&num);**

**while (num!=0)**

**{**

**digit=num%10;**

**sum=sum+digit;**

**rev=rev\*10+digit;**

**num=num/10;**

**}**

**printf("Sum of digits: %d",sum);**

**printf("\nReversed number: %d",rev);**

**return 0;**

**}**

1. **Arrays**

**1.** **Write a C program that accepts 10 integers from the user and stores them in an array. The program should then find and print the maximum and minimum values in the array.**

**=>**

**#include <stdio.h>**

**int main()**

**{**

**int arr[100],i,max,min,size;**

**printf("\nEnter the size of element:");**

**scanf("%d",&size);**

**for (i=0;i<size;i++)**

**{**

**printf("\nenter the element of arr[%d]",i);**

**scanf("%d",&arr[i]);**

**}**

**max=min=arr[0];**

**for (i=1;i<size;i++)**

**{**

**if (arr[i] > max)**

**{**

**max = arr[i];**

**}**

**if (arr[i] < min)**

**{**

**min = arr[i];**

**}**

**}**

**printf("\nMaximum value: %d",max);**

**printf("\nMinimum value: %d",min);**

**return 0;**

**}**

**Challenge**

**#include<stdio.h>**

**int main()**

**{**

**int arr[100],size,i,j,temp;**

**printf("\nEnter the size of an array = ");**

**scanf("%d",&size);**

**for(i=0;i<size;i++)**

**{**

**printf("\nEnter the element in arr[%d] = ",i);**

**scanf("%d",&arr[i]);**

**}**

**for(i=0;i<size;i++)**

**{**

**for(j=i+1;j<size;j++)**

**{**

**if(arr[i]>arr[j])**

**{**

**temp=arr[i];**

**arr[i] = arr[j];**

**arr[j] = temp;**

**}**

**}**

**}**

**printf("\nArray in ascending order = ");**

**for(i=0;i<size;i++)**

**{**

**printf("%d ",arr[i]);**

**}**

**}**

**2.** **Write a C program that accepts two 2x2 matrices from the user and adds them. Display the resultant matrix.**

**=>**

**#include<stdio.h>**

**int main()**

**{**

**int a[30][30],b[30][30],ans[30][30];**

**int size,i,j;**

**printf("\nEnter the size of an array = ");**

**scanf("%d",&size);**

**printf("\nEnter elements for the first 2x2 matrix:\n");**

**for(i=0;i<size;i++)**

**{**

**for(j=0;j<size;j++)**

**{**

**scanf("%d",&a[i][j]);**

**}**

**}**

**printf("\nEnter elements for the second 2x2 matrix:\n");**

**for(i=0;i<size;i++)**

**{**

**for(j=0;j<size;j++)**

**{**

**scanf("%d",&b[i][j]);**

**}**

**}**

**for(i=0;i<size;i++)**

**{**

**for(j=0;j<size;j++)**

**{**

**ans[i][j] = a[i][j] + b[i][j];**

**}**

**}**

**printf("\nResultant matrix after addition\n");**

**for(i=0;i<size;i++)**

**{**

**for(j=0;j<size;j++)**

**{**

**printf("%d ",ans[i][j]);**

**}**

**printf("\n");**

**}**

**return 0;**

**}**

**Challenge:**

**#include<stdio.h>**

**int main()**

**{**

**int a[30][30],b[30][30],ans[30][30];**

**int size,i,j;**

**printf("\nEnter the size of an array = ");**

**scanf("%d",&size);**

**printf("\nEnter elements for the first 3x3 matrix:\n");**

**for(i=0;i<size;i++)**

**{**

**for(j=0;j<size;j++)**

**{**

**scanf("%d",&a[i][j]);**

**}**

**}**

**printf("\nEnter elements for the second 3x3 matrix:\n");**

**for(i=0;i<size;i++)**

**{**

**for(j=0;j<size;j++)**

**{**

**scanf("%d",&b[i][j]);**

**}**

**}**

**for(i=0;i<size;i++)**

**{**

**for(j=0;j<size;j++)**

**{**

**ans[i][j] = a[i][j] + b[i][j];**

**}**

**}**

**for(i=0;i<size;i++)**

**{**

**for(j=0;j<size;j++)**

**{**

**ans[i][j] = 0;**

**for(k=0;k<size;k++)**

**{**

**ans[i][j] = ans[i][j] + (a[i][k]\*b[k][j]);**

**}**

**}**

**}**

**printf("\nResultant matrix after addition\n");**

**for(i=0;i<size;i++)**

**{**

**for(j=0;j<size;j++)**

**{**

**printf("%d ",ans[i][j]);**

**}**

**printf("\n");**

**}**

**printf("\nResultant matrix after multiplication:\n");**

**for(i=0;i<size;i++)**

**{**

**for(j=0;j<size;j++)**

**{**

**printf("%d ",a[i][j]);**

**}**

**printf("\n");**

**return 0;**

**}**

1. **Write a C program that takes N numbers from the user and stores them in an array. The program should then calculate and display the sum of all array elements.**

**=>**

**#include<stdio.h>**

**int main()**

**{**

**int arr[100],size,i,sum=0;**

**printf("\nEnter the size of an array = ");**

**scanf("%d",&size);**

**for(i=0;i<size;i++)**

**{**

**printf("\nEnter the element %d = ",i+1);**

**scanf("%d",&arr[i]);**

**sum = sum + arr[i];**

**}**

**printf("\nArray = ");**

**for(i=0;i<size;i++)**

**{**

**printf("%d ",arr[i]);**

**}**

**printf("\nThe sum of an array = %d",sum);**

**printf("\nThe average of an array = %.2f",(float)sum/(float)size);**

**return 0;**

**}**

**5.Functions**

1. **Write a C program that generates the Fibonacci sequence up to N terms using a recursive function.**

**=>**

**#include<stdio.h>**

**int fibonacci()**

**{**

**int terms,i,n1=0,n2=1,n3;**

**printf("\nEnter the terms = ");**

**scanf("%d",&terms);**

**printf("\nFibonnaci series = %d %d ",n1,n2);**

**for(i=1;i<=terms-2;i++)**

**{**

**n3 = n1+n2;**

**printf("%d ",n3);**

**n1 = n2;**

**n2 = n3;**

**}**

**}**

**int main()**

**{**

**fibonacci();**

**return 0;**

**}**

1. **Write a C program that calculates the factorial of a given number using a function.**

**=>**

**#include<stdio.h>**

**int factorial(int num)**

**{**

**int i,fact=1;**

**for(i=1;i<=num;i++)**

**{**

**fact = fact \* i;**

**}**

**printf("\nFactorial of %d is %d",num,fact);**

**}**

**int main()**

**{**

**int num;**

**printf("\nEnter the number = ");**

**scanf("%d",&num);**

**factorial(num);**

**}**

1. **Write a C program that takes a number as input and checks whether it is a palindrome using a function.**

**=>**

**#include <stdio.h>**

**int Palindrome(int num)**

**{**

**int reversed=0,remainder;**

**int original=num;**

**while (num != 0)**

**{**

**remainder = num % 10;**

**reversed = reversed \* 10 + remainder;**

**num=num/10;**

**}**

**return original == reversed;**

**}**

**int main()**

**{**

**int num;**

**printf("Enter the number:");**

**scanf("%d", &num);**

**if(Palindrome(num))**

**{**

**printf("\n%d is a palindrome", num);**

**} else {**

**printf("\n%d is not a palindrome", num);**

**}**

**return 0;**

**}**

**6.Strings**

**1.** **Write a C program that takes a string as input and reverses it using a function**

**=>**

**#include<stdio.h>**

**int main()**

**{**

**char str1[100],str2[100];**

**printf("\nEnter the value in str1 = ");**

**gets(str1);**

**printf("\nEnter the value in str2 = ");**

**gets(str2);**

**printf("\nOriginal value of str1 = %s",str1);**

**printf("\nOriginal value of str2 = %s",str2);**

**strrev(str1);**

**printf("\nReversed string = %s",str1);**

**printf("\nReversed string = %s",strrev(str2));**

**return 0;**

**}**

**Challenge:**

**#include<stdio.h>**

**void reverse(char ch[])**

**{**

**int len=0,i;**

**for(i=0;ch[i]!='\0';i++)**

**{**

**len++;**

**}**

**printf("\nReversed string = ");**

**for(i=len-1;i>=0;i--)**

**{**

**printf("%c",ch[i]);**

**}**

**}**

**int main()**

**{**

**char str[100];**

**printf("\nEnter the string = ");**

**gets(str);**

**printf("\nOriginal string = %s",str);**

**reverse(str);**

**return 0;**

**}**

**2.** **Write a C program that takes a string from the user and counts the number of vowels and consonants in the string.**

**=>**

**#include<stdio.h>**

**int main()**

**{**

**char str[100];**

**char vowel[100],con[100];**

**int vowel1=0,con1=0,j=0,k=0,i;**

**printf("\nEnter the value in str = ");**

**gets(str);**

**for(i=0;str[i]!='\0';i++)**

**{**

**if(str[i]=='a' ||str[i]=='e' ||str[i]=='i' ||str[i]=='o' ||str[i]=='u' ||str[i]=='A' ||str[i]=='E' ||str[i]=='I' ||str[i]=='O' ||str[i]=='U')**

**{**

**vowel1++;**

**vowel[j] = str[i];**

**j++;**

**}**

**else**

**{**

**con1++;**

**con[k] = str[i];**

**k++;**

**}**

**}**

**printf("\nVowels = %d",vowel1);**

**printf("\nConsonants = %d",con1);**

**printf("\n\nVowels = ");**

**for(i=0;i<j;i++)**

**{**

**printf("%c ",vowel[i]);**

**}**

**printf("\nConsonants = ");**

**for(i=0;i<k;i++)**

**{**

**printf("%c ",con[i]);**

**}**

**return 0;**

**}**

**Challenge:**

**#include<stdio.h>**

**int main()**

**{**

**char str[100];**

**char num[100],sp[100];**

**int k=0,m=0,i;**

**printf("\nEnter the value in str = ");**

**gets(str);**

**for(i=0;str[i]!='\0';i++)**

**{**

**if(str[i]>='0' && str[i]<='9')**

**{**

**num[k] = str[i];**

**k++;**

**}**

**else**

**{**

**sp[m] = str[i];**

**m++;**

**}**

**}**

**printf("\nOriginal value of str = %s",str);**

**printf("\ndigit = ");**

**for(i=0;i<k;i++)**

**{**

**printf("%c ",num[i]);**

**}**

**printf("\nspecial characters = ");**

**for(i=0;i<m;i++)**

**{**

**printf("%c ",sp[i]);**

**}**

**return 0;**

**}**

**3.Write a C program that counts the number of words in a sentence entered by the user.**

**=>**

**#include<stdio.h>**

**int main()**

**{**

**char str[100];**

**int wordcout=1,i;**

**printf("\nEnter the str = ");**

**gets(str);**

**printf("\nOriginal value of str = %s",str);**

**for(i=0;str[i]!='\0';i++)**

**{**

**if(str[i]==' ' && str[i+1]!='\0' && str[i-1]!=' ')**

**{**

**wordcout++;**

**}**

**}**

**printf("\nNumber of words = %d",wordcout);**

**return 0;**

**}**

**Extra Challenges**

**1.** **Write a C program that checks whether a given number is an Armstrong number or not (e.g., 153 =1^3+5^3+3^3)**

**=>**

**#include<stdio.h>**

**int main()**

**{**

**int num,digit=0,sum=0,power,i,rem;**

**printf("\nEnter the number = ");**

**scanf("%d",&num);**

**int temp = num;**

**int copy = num;**

**while(num!=0)**

**{**

**num = num/10;**

**digit++;**

**}**

**for(i=1;i<=digit;i++)**

**{**

**rem = temp%10;**

**power = pow(rem,digit);**

**sum = sum + power;**

**temp = temp/10;**

**}**

**if(sum==copy)**

**{**

**printf("\n%d is an armstrong number",copy);**

**}**

**else**

**{**

**printf("\n%d is not an armstrong number",copy);**

**}**

**return 0;**

**}**