

TRIBHUVAN UNIVERSITY SIDDHANATH SCIENCE CAMPUS



Programming in C Lab Manual for the Academic Year B.Sc. CSIT Ist Sem

Signature of Class-Teacher



SIDDHANATH SCIENCE CAMPUS

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Department of Computer Science &IT

Lab Manual for the Academic Year

(In accordance with TU syllabus)

SUBJECT : Programming in C
SUBJECT CODE : CSC 102
SEMESTER : First
STREAM : Computer Science & IT
STUDENT- NAME :
ROLL NO :

Suggestions from Teacher:

Enhancement if any:

GUIDELINES TO STUDENTS:

- 2 Equipment in the lab for the use of student community. Students need to maintain a proper decorum in the computer lab. Students must use the equipment with care. Any damage is caused is punishable.
- 3 Students are required to carry their observation / programs book with completed exercises while entering the lab.
- 4 Students are supposed to occupy the machines allotted to them and are not supposed to talk or make noise in the lab. The allocation is put up on the lab notice board.
- 5 Lab can be used in free time / lunch hours by the students who need to use the systems, but they should take prior permission from the lab in-charge.
- 6 Lab records need to be submitted on or before date of submission.
- 7 Students are not supposed to use floppy disks.
- 8 Make a content page given in next page in your Lab report and submit to class teacher.

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Basic C Programs

Write a program to display Siddhanath Science Campus.

```
#include<stdio.h>
#include<conio.h>
void main()
{
    clrscr();
    printf("Siddhanath Science Campus");
    getch();
}
```

Write a program to add, subtract, multiply, and divide two numbers.

```
#include<stdio.h>
#include<conio.h>
void main()
{
    clrscr();
    int a, b, c;
    float d;
    printf("Enter two numbers:\n");
    scanf("%d%d", &a, &b);
    c = a + b;
    printf("\nSum = %d", c);
    c = a - b;
    printf("\nDifference = %d", c);
    c = a * b;
    printf("\nMultiplication = %d", c);
    d = (float)a / b;
    printf("\nDivision = %f", d);
    getch();
}
```

Write a program to find simple interest.

```
#include<stdio.h>
#include<conio.h>
void main()
{
    clrscr();
    float p, t, r, i;
    printf("Enter principal, time, and rate:\n");
    scanf("%f%f%f", &p, &t, &r);
    i = p * t * r / 100;
    printf("Interest = %f", i);
    getch();
}
```

Write a program to convert a temperature given in Celsius to Fahrenheit.

```
#include<stdio.h>
#include<conio.h>
```

```

void main()
{
    clrscr();
    float c, f;
    printf("Enter temperature in celsius:");
    scanf("%f", &c);
    f = c * 9 / 5 + 32;
    printf("Temperature in fahrenheit = %f", f);
    getch();
}

```

Write a program to find square root of a given number.

```

#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
    clrscr();
    float n, s;
    printf("Enter a number:");
    scanf("%f", &n);
    s = sqrt(n);
    printf("Square root of %f is %f", n, s);
    getch();
}

```

Write a program to find power of a given number.

```

#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
    clrscr();
    float n, m, p;
    printf("Enter two numbers:\n");
    scanf("%f%f", &n, &m);
    p = pow(n, m);
    printf("Power = %f", p);
    getch();
}

```

Write a program to find area and circumference of circle.

```

#include<stdio.h>
#include<conio.h>
#include<math.h>
#define PI 3.1415
void main()
{
    clrscr();

```

```

float r, a, c;
printf("Enter radius:");
scanf("%f", &r);
a = PI * pow(r, 2);
c = 2 * PI * r;
printf("Area = %f\n",a);
printf("Circumference = %f",c);
getch();
}

```

Write a program to find area and perimeter of a rectangle .

```

#include<stdio.h>
#include<conio.h>
void main()
{
    clrscr();
    float l, b, a, p;
    printf("Enter length and breadth:\n");
    scanf("%f%f", &l, &b);
    a = l * b;
    p = 2 * (l + b);
    printf("Area = %f\n",a);
    printf("Perimeter = %f",p);
    getch();
}

```

Write a program to find price of n mangos given the price of a dozen mangos.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    clrscr();
    float pricedozen, pricen;
    int n;
    printf("Enter price of a dozen mangos:");
    scanf("%f", &pricedozen);
    printf("Enter number of mangos:");
    scanf("%d", &n);
    pricen = pricedozen / 12 * n;
    printf("Price of %d mangos is % f", n, pricen);
    getch();
}

```

Write a program to convert pounds to kilograms.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    clrscr();
    float p, k;

```

```

    printf("Enter pounds:");
    scanf("%f", &p);
    k = p / 2.2;
    printf("Kilogram = %f", k);
    getch();
}

```

Write a program to find the rupee equivalent of U.S. dollars.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    clrscr();
    float d, cr, r;
    printf("Enter dollars:");
    scanf("%f", &d);
    printf("Enter conversion rate:");
    scanf("%f", &cr);
    r = d * cr;
    printf("Rupees = %f", r);
    getch();
}

```

Write a program to express a length given in millimeters in meters, centimeters, and millimeters.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    clrscr();
    float mm, m, cm;
    printf("Enter millimeters:");
    scanf("%f", &mm);
    cm = mm / 10;
    m = cm / 100;
    printf("Meter = %f\n", m);
    printf("Centimeter = %f\n", cm);
    printf("Millimeter = %f", mm);
    getch();
}

```

Control Structures

Write a program to calculate discount. If purchased amount is greater than or equal to 1000, discount is 5% .

```

#include<stdio.h>
#include<conio.h>
void main()
{
    float pa, d = 0;
    clrscr();

```

```

printf("Enter purchased amount:");
scanf("%f", &pa);
if(pa >= 1000)
    d = pa * 0.05;
printf("Discount = %f", d);
getch();
}

```

Write a program to calculate discount. If purchased amount is greater than or equal to 1000, discount is 5%. If purchased amount is less than 1000, discount is 3%.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    float pa, d;
    clrscr();
    printf("Enter purchased amount:");
    scanf("%f", &pa);
    if(pa >= 1000)
        d = pa * 0.05;
    else
        d = pa * 0.03;
    printf("Discount = %f", d);
    getch();
}

```

Write a program to calculate discount:

- a) If purchased amount is greater than or equal to 5000, discount is 10%**
- b) If purchased amount is greater than or equal to 4000 and less than 5000, discount is 7%**
- c) If purchased amount is greater than or equal to 3000 and less than 4000, discount is 5%**
- d) If purchased amount is greater than or equal to 2000 and less than 3000, discount is 3%**
- e) If purchased amount is less than 2000, discount is 2%.**

```

#include<stdio.h>
#include<conio.h>
void main()
{
    float pa, d;
    clrscr();
    printf("Enter purchased amount:");
    scanf("%f", &pa);
    if(pa >= 5000)
        d = pa * 0.1;
    else if(pa >= 4000)
        d = pa * 0.07;
    else if(pa >= 3000)
        d = pa * 0.05;
    else if(pa >= 2000)
        d = pa * 0.03;
    else

```

```

        d = pa * 0.02;
        printf("Discount = %f", d);
        getch();
    }

```

Write a program to check whether a number is even or odd.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int num;
    clrscr();
    printf("Enter a number:");
    scanf("%d", &num);
    if(num % 2 == 0)
        printf("%d is even", num);
    else
        printf("%d is odd", num);
    getch();
}

```

Write a program to calculate the simple interest.

- a) If balance is greater than 99999, interest is 7 %**
- b) If balance is greater than or equal to 50000 and less than 100000 interest is 5 %**
- c) If balance is less than 50000, interest is 3% .**

```

#include<stdio.h>
#include<conio.h>
void main()
{
    float b, i, t;
    clrscr();
    printf("Enter balance and time:\n");
    scanf("%f%f", &b, &t);
    if(b > 99999)
        i = b * t * 0.07;
    else if(b >= 50000)
        i = b * t * 0.05;
    else
        i = b * t * 0.03;
    printf("Interest = %f", i);
    getch();
}

```

Admission to a professional course is subject to the following conditions:

- a) Marks in mathematics >= 60**
- b) Marks in physics >= 50**
- c) Marks in chemistry >= 40**
- d) Total in all three subjects >= 200**

OR

Total in mathematics and physics >=150

Write a program to process the applications to list eligible candidates.

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int m, p, c, tmpc, tmp;
    clrscr();
    printf("Enter marks in mathematics, physics, and chemistry:\n");
    scanf("%d%d%d", &m, &p, &c);
    tmpc = m + p + c;
    tmp = m + p;
    if((m >= 60 && p >= 50 && c >= 40 && tmpc >= 200) || (tmp >= 150))
        printf("Eligible");
    else
        printf("Not eligible");
    getch();
}
```

A leap year should meet the following condition:

a) For non-century years it should be exactly divisible by 4

b) For century years it should be exactly divisible by 400

Write a program to check a year for leap.

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int year;
    clrscr();
    printf("Enter a year:");
    scanf("%d", &year);
    if(year % 400 == 0 || (year % 100 != 0 && year % 4 == 0))
        printf("Year %d is a leap year", year);
    else
        printf("Year %d is not a leap year", year);
    getch();
}
```

Rates of tax on gross salary are as shown below:

Income	Tax
Less than 10,000	Nil
Rs. 10,000 to 19,999	10%
Rs. 20,000 to 39,999	15%
Rs. 40,000 to above	20%

Write a program to compute the net salary after deducting the tax for the given information.

```
#include<stdio.h>
#include<conio.h>
void main()
{
```

```
    float gs, tax, ns;
```

```

clrscr();
printf("Enter gross salary:");
scanf("%f", &gs);
if(gs < 10000)
    tax = 0;
else if(gs <= 19999)
    tax = gs * 0.1;
else if(gs <= 39999)
    tax = gs * 0.15;
else
    tax = gs * 0.2;
ns = gs - tax;
printf("Net salary = %f", ns);
getch();
}

```

Write a program to print the largest number among three numbers input by the user.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int a, b, c, largest;
    clrscr();
    printf("Enter three numbers:\n");
    scanf("%d%d%d", &a, &b, &c);
    largest = a;
    if(b > largest)
        largest = b;
    if(c > largest)
        largest = c;
    printf("Largest number is %d", largest);
    getch();
}

```

Write a program to find the roots of a quadratic equation using discriminant.

```

#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
    float a, b, c, disc, x1, x2;
    clrscr();
    printf("Enter values for a, b, and c:\n");
    scanf("%f%f%f", &a, &b, &c);
    disc = b*b - 4*a*c;
    if(disc >= 0)
    {
        x1 = (-b + sqrt(disc)) / (2 * a);
        x2 = (-b - sqrt(disc)) / (2 * a);
    }
}

```

```

        printf("Real root 1 = %f\n", x1);
        printf("Real root 2 = %f", x2);
    }
    else
    {
        x1 = -b/(2*a);
        x2 = sqrt(fabs(disc))/(2*a);
        printf("The roots are complex\n");
        printf("The first root = %f+i%f\n", x1, x2);
        printf("The second root = %f-i%f\n", x1, x2);
    }
    getch();
}

```

Given marks in five subjects. Write a program (a) to display “PASS” or “FAIL” if assumed pass marks is 45 in each subject, (b) to find percentage of marks obtained, and (c) to find division for “PASS” students assuming that 80% and above for “DISTINCTION”, 60% and above for “FIRST DIVISION” otherwise “SECOND DIVISION”.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int m1, m2, m3, m4, m5, t;
    float p;
    clrscr();
    printf("Enter marks in five subjects:\n");
    scanf("%d%d%d%d%d", &m1, &m2, &m3, &m4, &m5);
    if(m1 >= 45 && m2 >= 45 && m3 >= 45 && m4 >= 45 && m5 >= 45)
        printf("Result = PASS");
    else
        printf("Result = FAIL");
    t = m1 + m2 + m3 + m4 + m5;
    p = (float)t / 5;
    printf("\nPercentage = %f\n", p);
    if(m1 >= 45 && m2 >= 45 && m3 >= 45 && m4 >= 45 && m5 >= 45)
        if(p >= 80)
            printf("DISTINCTION");
        else if(p >= 60)
            printf("FIRST DIVISION");
        else
            printf("SECOND DIVISION");
    getch();
}

```

Write a program using switch statement to develop a simple calculator for +, -, *, /, and % operators .

```

#include<stdio.h>
#include<conio.h>
void main()

```

```

{
    char op;
    int a, b, c;
    float d;
    clrscr();
    printf("Enter two numbers:\n");
    scanf("%d%d", &a, &b);
    printf("Enter an operator(+, -, *, /, or %):");
    scanf(" %c", &op);
    switch(op)
    {
        case '+':
            c = a + b;
            printf("Sum = %d", c);
            break;
        case '-':
            c = a - b;
            printf("Difference = %d", c);
            break;
        case '*':
            c = a * b;
            printf("Product = %d", c);
            break;
        case '/':
            d = (float)a / b;
            printf("Division = %f", d);
            break;
        case '%':
            c = (int)a % (int)b;
            printf("Remainder = %d", c);
            break;
        default:
            printf("Wrong operator");
    }
    getch();
}

```

Looping Structures

Write a program to isplay your name 10 times using all the three looping statements.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int i;
    clrscr();
    for(i = 0; i < 10; i++)
        printf("Siddhanath\n");
    getch();
}

```

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int i = 0;
    clrscr();
    while(i < 10)
    {
        printf("Siddhanath \n");
        i++;
    }
    getch();
}
```

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int i = 0;
    clrscr();
    do
    {
        printf("Siddhanath \n");
        i++;
    }while(i < 10);
    getch();
}
```

Write a program to display first n natural numbers, their sum, and their average using all the three looping statements.

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int n, i, sum = 0;
    float avg;
    clrscr();
    printf("Enter n:");
    scanf("%d", &n);
    printf("First %d natural numbers are:", n);
    for(i = 1; i <= n; i++)
    {
        printf("\n%d", i);
        sum = sum + i; //sum += i;
    }
    avg = (float)sum / n;
    printf("\nSum = %d", sum);
    printf("\nAverage = %f", avg);
    getch();
}
```

```
#include<stdio.h>
#include<conio.h>
void main()
{
```

```

    int n, i = 1, sum = 0;
    float avg;
    clrscr();
    printf("Enter n:");
    scanf("%d", &n);
    printf("First %d natural numbers are:", n);
    while(i <= n)
    {
        printf("\n%d", i);
        sum = sum + i; //sum += i;
        i++;
    }
    avg = (float)sum / n;
    printf("\nSum = %d", sum);
    printf("\nAverage = %f", avg);
    getch();
}

#include<stdio.h>
#include<conio.h>
void main()
{
    int n, i = 1, sum = 0;
    float avg;
    clrscr();
    printf("Enter n:");
    scanf("%d", &n);
    printf("First %d natural numbers are:", n);
    do
    {
        printf("\n%d", i);
        sum = sum + i; //sum += i;
        i++;
    }while(i <= n);
    avg = (float)sum / n;
    printf("\nSum = %d", sum);
    printf("\nAverage = %f", avg);
    getch();
}

```

Write a program to display the temperatures from 0 degrees Celsius to 100 degrees Celsius and their Fahrenheit equivalent.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int c;
    float f;
    clrscr();
    for(c = 0; c <= 100; c++)
    {
        f = (float)c * 9 / 5 + 32;
        printf("\n%f", f);
    }
}

```

```

        getch();
    }

```

Write a program to calculate sum of first 10 even numbers.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int e, sum = 0;
    clrscr();
    for(e = 0; e <= 10; e = e + 2)
        sum = sum + e;
    printf("Sum = %d", sum);
    getch();
}

```

Write a program to find out sum of all numbers completely divisible by 5 among n numbers given by the user.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int n, sum = 0, i;
    clrscr();
    printf("Enter n:");
    scanf("%d", &n);
    for(i = 5; i <= n; i = i + 5)
        sum = sum + i;
    printf("Sum = %d", sum);
    getch();
}

```

Write a program to determine the sum of the harmonic series ($1 + 1/2 + 1/3 + 1/4 + \dots + 1/n$) for a given value of n.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int n, i;
    float sum = 0;
    clrscr();
    printf("Enter n:");
    scanf("%d", &n);
    for(i = 1; i <= n; i = i + 1)
        sum = sum + 1.0 / i;
    printf("Sum = %f", sum);
    getch();
}

```

Write a program to find the sum of the series $1 + x^2 + 3x^2 + 4x^2 + \dots + nx^2$.

```

#include<stdio.h>
#include<conio.h>
void main()

```

```

{
    int n, x, i, sum;
    clrscr();
    printf("Enter values of x and n:\n");
    scanf("%d%d", &x, &n);
    sum = 1 + x * x;
    for(i = 3; i <= n; i = i + 1)
        sum = sum + i * x * x;
    printf("Sum = %d", sum);
    getch();
}

```

Write a program to calculate the sequence $1/1! + 2/2! + 3/3! + \dots + n/n!$ where n is the number of input by the user.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int n, i, j, facto;
    float sum = 0;
    clrscr();
    printf("Enter n:");
    scanf("%d", &n);
    for(i = 1; i <= n; i++)
    {
        facto = 1;
        for(j = 1; j <= i; j++)
            facto = facto * j;
        sum = sum + (float)i / facto;
    }
    printf("Sum = %f", sum);
    getch();
}

```

Write a program to display sum of the following series up to n terms: $\text{Sum} = x - x^2 + x^3 - x^4 + \dots$

```

#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
    int x, n, sum = 0, i;
    clrscr();
    printf("Enter values of x and n:\n");
    scanf("%d%d", &x, &n);
    for(i = 1; i <= n; i++)
    {
        if(i%2 == 0)
            sum = sum - pow(x, i);
        else
            sum = sum + pow(x, i);
    }
    printf("Sum = %d", sum);
    getch();
}

```

```
}
```

Write a program to find X of the following series for the given value of a and N.

$X = a - a^2/2 + a^3/3 - a^4/4 \dots \text{up to } N$

```
#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
    int a, n, i;
    float x = 0;
    clrscr();
    printf("Enter values of a and n:\n");
    scanf("%d%d", &a, &n);
    for(i = 1; i <= n; i++)
    {
        if(i%2 == 0)
            x = x - pow(a, i) / i;
        else
            x = x + pow(a, i) / i;
    }
    printf("X = %f", x);
    getch();
}
```

Given an integer, write a program to reverse and print it.

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int n, num, digit;
    clrscr();
    printf("Enter value of n:");
    scanf("%d", &n);
    num = n;
    while(num != 0)
    {
        digit = num % 10;
        printf("%d", digit);
        num = num / 10;
    }
    getch();
}
```

Write a program to compute the sum of the digits of the given integer number.

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int n, num, digit, sum = 0;
    clrscr();
    printf("Enter value of n:");
    scanf("%d", &n);
    num = n;
```

```

while(num != 0)
{
    digit = num % 10;
    sum = sum + digit;
    num = num / 10;
}
printf("Sum = %d", sum);
getch();
}

```

Given an integer, write a program to check it for palindrome.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int n, num, digit, rev = 0;
    clrscr();
    printf("Enter value of n:");
    scanf("%d", &n);
    num = n;
    while(num != 0)
    {
        digit = num % 10;
        rev = (rev * 10) + digit;
        num = num / 10;
    }
    if(n == rev)
        printf("Palindrome");
    else
        printf("Not a palindrome");
    getch();
}

```

Write a program to find factorial of a number.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int n, i;
    long facto = 1;
    clrscr();
    printf("Enter n:");
    scanf("%d", &n);
    for(i = 1; i <= n; i++)
        facto = facto * i;
    printf("%d!=%ld", n, facto);
    getch();
}

```

Write a program to obtain the first 25 numbers of Fibonacci series.

```

#include<stdio.h>
#include<conio.h>
void main()
{

```

```

int f1 = 1, f2 = 1, f3, i;
clrscr();
printf("%d\n", f1);
printf("%d\n", f2);
for(i = 0; i < 23; i++)
{
    f3 = f1 + f2;
    f1 = f2;
    f2 = f3;
    printf("%d\n", f3);
}
getch();
}

```

Write a program to display all prime numbers less than 100.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int i, j, prime;
    for(i = 2; i < 100; i++)
    {
        prime = 1;
        for(j = 2; j < i; j++)
        {
            if(i % j == 0)
            {
                prime = 0;
                break;
            }
        }
        if(prime)
            printf("%d\n", i);
    }
    getch();
}

```

Write a program to display all the leap years starting from 1900 to 2000.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int year;
    clrscr();
    printf("Leap years starting from 1900 to 2000:\n");
    for(year = 1900; year <= 2000; year++)
        if(year % 400 == 0 || (year % 100 != 0 && year % 4 == 0))
            printf("%d\n", year);
    getch();
}

```

Write a program to display the following menu:

1. To find area of circle

2. To check the given number is odd or even
3. To find the sum of N numbers
4. Exit

Perform above task until the user wants to exit.

```
#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
#define TRUE 1
#define PI 3.1415
void main()
{
    int choice, n, N, i;
    float r, a, num, sum;
    clrscr();
    printf("1. Find area of circle\n");
    printf("2. Check the given number is odd or even\n");
    printf("3. Find the sum of N numbers\n");
    printf("4. Exit\n");
    while(TRUE)
    {
        printf("Enter a choice:");
        scanf("%d", &choice);
        switch(choice)
        {
            case 1:
                printf("Enter radius:");
                scanf("%f", &r);
                a = PI * r * r;
                printf("Area of circle = %f\n", a);
                break;
            case 2:
                printf("Enter a number:");
                scanf("%d", &n);
                if(n % 2 == 0)
                    printf("%d is even\n", n);
                else
                    printf("%d is odd\n", n);
                break;
            case 3:
                sum = 0;
                printf("Enter value of N:");
                scanf("%d", &N);
                printf("Enter %d numbers:\n", N);
                for(i = 0; i < N; i++)
                {
                    scanf("%f", &num);
                    sum = sum + num;
                }
                printf("Sum = %f\n", sum);
                break;
            case 4:
                exit(0);
            default:
```

```

        printf("Wrong choice!Try again\n");
    }
}

```

Write a program to print the following outputs using for loops:

```

1
2 2
3 3 3
4 4 4 4
5 5 5 5 5

```

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int i, j;
    clrscr();
    for(i = 1; i <= 5; i++)
    {
        for(j = 1; j <= i; j++)
            printf("%d ", i);
        printf("\n");
    }
    getch();
}

```

Functions

Write a program to find greater number between two numbers using function.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int a, b, c;
    int greater(int, int); //function prototype or declaration
    clrscr();
    printf("Enter two numbers:\n");
    scanf("%d%d", &a, &b);
    c = greater(a, b); //function call
    printf("Greater number = %d", c);
    getch();
}

int greater(int a, int b) //function definition
{
    if(a > b)
        return a;
    else
        return b;
}

```

Write a program using function to calculate and return sum of following series up to n terms; where x and n are supposed as passed by main program; $\text{sum} = x - x^2 + x^3 - x^4 + \dots$

```

#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
    int x, n, s;
    int sum(int, int);
    clrscr();
    printf("Enter values of x and n:\n");
    scanf("%d%d", &x, &n);
    s = sum(x, n);
    printf("Sum = %d", s);
    getch();
}
int sum(int x, int n)
{
    int i, s = 0;
    for(i = 1; i <= n; i++)
    {
        if(i%2 == 0)
            s = s - pow(x, i);
        else
            s = s + pow(x, i);
    }
    return s;
}

```

A five digit positive integer is entered through the keyboard; write program using function to calculate the sum of the digits of the number. The function should receive the integer from main () and output also be printed through main ().

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int n, s;
    int sum(int);
    clrscr();
    printf("Enter a five digit positive integer:");
    scanf("%d", &n);
    s = sum(n);
    printf("Sum = %d", s);
    getch();
}
int sum(int n)
{
    int num, digit, s = 0;
    num = n;
    while(num != 0)
    {

```

```

        digit = num % 10;
        s = s + digit;
        num = num / 10;
    }
    return s;
}

```

Write a program to calculate factorial of a number using recursive function and the same program without using recursive function.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int n;
    long facto;
    long factorial(int);
    printf("Enter value of n:");
    scanf("%d", &n);
    facto = factorial(n);
    printf("%d! = %ld", n, facto);
    getch();
}
long factorial(int n)
{
    if(n == 0)
        return 1;
    else
        return n * factorial(n - 1);
}

```

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int n;
    long facto;
    long factorial(int);
    printf("Enter value of n:");
    scanf("%d", &n);
    facto = factorial(n);
    printf("%d! = %ld", n, facto);
    getch();
}
long factorial(int n)
{
    long facto = 1;
    int i;
    if(n==0)
        facto = 1;
}

```

```

        else
            for(i=1;i<=n;i++)
                facto=facto*i;
        return facto;
    }

```

Write a program to calculate b^n using recursive as well as non recursive function.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int b, n;
    long p;
    long power(int b, int n);
    clrscr();
    printf("Enter value of b and n:\n");
    scanf("%d%d", &b, &n);
    p = power(b, n);
    printf("Power = %ld", p);
    getch();
}

```

```

long power(int b, int n)
{
    if(n == 0)
        return 1;
    else
        return b * power(b, n - 1);
}

```

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int b, n;
    long p;
    long power(int b, int n);
    clrscr();
    printf("Enter value of b and n:\n");
    scanf("%d%d", &b, &n);
    p = power(b, n);
    printf("Power = %ld", p);
    getch();
}

```

```

long power(int b, int n)
{
    int p = 1, i;
    for(i = 0; i < n; i++)
        p = p * b;
    return p;
}

```

Write a program to find sum of first n natural numbers using recursive function.

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int n, s;
    int sum(int);
    clrscr();
    printf("Enter the value of n:");
    scanf("%d", &n);
    s = sum(n);
    printf("Sum of first %d natural numbers = %d", n, s);
    getch();
}
int sum(int n)
{
    if(n == 1)
        return 1;
    else
        return n + sum(n - 1);
}
```

Write a program to find product of first n natural numbers using recursive function.

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int n;
    long p;
    long prod(int);
    clrscr();
    printf("Enter the value of n:");
    scanf("%d", &n);
    p = prod(n);
    printf("Product of first %d natural numbers = %ld", n, p);
    getch();
}
long prod(int n)
{
    if(n == 1)
        return 1;
    else
        return n * prod(n - 1);
}
```

Write a program to find nth Fibonacci number using recursive function.

```
#include<stdio.h>
#include<conio.h>
void main()
```

```

{
    int n, f;
    int fibo(int);
    clrscr();
    printf("Enter the value of n:");
    scanf("%d", &n);
    f = fibo(n);
    printf("Fibonacci number = %d", f);
    getch();
}
int fibo(int n)
{
    if(n == 1 || n == 2)
        return 1;
    else
        return fibo(n - 1) + fibo(n - 2);
}

```

Write a program to find Fibonacci series up to n terms using recursive function.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int n, f, i;
    int fibo(int);
    clrscr();
    printf("Enter the value of n:");
    scanf("%d", &n);
    printf("Fibonacci series up to %d terms:\n", n);
    for(i = 1; i <= n; i++)
    {
        f = fibo(i);
        printf("%d\n", f);
    }
    getch();
}
int fibo(int i)
{
    if(i == 1 || i == 2)
        return 1;
    else
        return fibo(i - 1) + fibo(i - 2);
}

```

Write macros to compute area and circumference of circle and make a program to use this macro.

```

#include<stdio.h>
#include<conio.h>
#include<math.h>
#define PI 3.1415

```

```

#define area(r) PI*pow(r,2)
#define circum(r) 2*PI*r
void main(void)
{
    float r,a,c;
    clrscr();
    printf("Enter radius:");
    scanf("%f",&r);
    a = area(r);
    c = circum(r);
    printf("Area = %f\n", a);
    printf("Circumference = %f", c);
    getch();
}

```

Write a program to calculate area and perimeter of a rectangle using macros.

```

#include<stdio.h>
#include<conio.h>
#define area(l,b) l*b
#define perimeter(l,b) 2*(l+b)
void main(void)
{
    int l, b, a, p;
    clrscr();
    printf("Enter length and breadth:\n");
    scanf("%d%d",&l, &b);
    a = area(l,b);
    p = perimeter(l,b);
    printf("Area = %d\n", a);
    printf("Perimeter = %d", p);
    getch();
}

```

Write a program to count number of times a function executes using static local variable.

```

#include<stdio.h>
#include<conio.h>
void main(void)
{
    int count;
    int test();
    clrscr();
    count = test();
    printf("%d\n", count); //1
    count = test();
    printf("%d\n", count); //2
    count = test();
    printf("%d", count); //3
    getch();
}

```

```
int test()
{
    static int count = 0;
    count++;
    return count;
}
```

Array & Strings

Write a program to read n numbers in an array and display their sum and average.

```
#include<stdio.h>
#include<conio.h>
#define SIZE 100
void main()
{
    float a[SIZE],sum=0,avg;
    int n,i;
    clrscr();
    printf("How many numbers?");
    scanf("%d",&n);
    printf("Enter numbers:\n");
    for(i=0;i<n;i++)
    {
        scanf("%f",&a[i]);
        sum=sum+a[i]; //sum+=a[i];
    }
    avg=sum/n;
    printf("Sum=%f\n",sum);
    printf("Average=%f",avg);
    getch();
}
```

Twenty-five numbers are entered through the keyboard into an array, write a program find out how many of them are even and how many of them are odd.

```
#include<stdio.h>
#include<conio.h>
#define SIZE 25
void main()
{
    int a[SIZE],counteven=0,countodd=0,i;
    clrscr();
    printf("Enter 25 numbers:\n");
    for(i=0;i<SIZE;i++)
    {
        scanf("%d",&a[i]);
        if(a[i]%2==0)
            counteven++;
        else
            countodd++;
    }
}
```

```

        printf("Even numbers=%d\n",counteven);
        printf("Odd numbers=%d",countodd);
        getch();
    }

```

Write a program to display largest and smallest number among 10 numbers stored in an array.

```

#include<stdio.h>
#include<conio.h>
#define SIZE 5
void main()
{
    float a[SIZE],smallest,largest;
    int i;
    clrscr();
    printf("Enter 10 numbers:\n");
    for(i=0;i<SIZE;i++)
        scanf("%f",&a[i]);
    smallest=largest=a[0];
    for(i=1;i<SIZE;i++)
    {
        if(a[i]<smallest)
            smallest=a[i];
        if(a[i]>largest)
            largest=a[i];
    }
    printf("Largest number=%f\n",largest);
    printf("Smallest number=%f",smallest);
    getch();
}

```

Write a program to search an element in array using sequential search.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int a[]={45,32,78,50,8,10,31,25,27,43},i,n;
    clrscr();
    printf("Enter element to search:");
    scanf("%d",&n);
    for(i=0;i<10;i++)
        if(n==a[i])
        {
            printf("Found at index %d",i);
            break;
        }
    if(i==10)
        printf("Not found");
    getch();
}

```

Write a program to search an element in array using binary search.

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int a[]={8,10,25,32,43,45,50,55,63,78},n,low,hi,mid;
    clrscr();
    printf("Enter element to search:");
    scanf("%d",&n);
    low=0;
    hi=9;
    while(low<=hi)
    {
        mid=(low+hi)/2;
        if(n==a[mid])
        {
            printf("Found at index %d",mid);
            break;
        }
        else if(n<a[mid])
            hi=mid-1;
        else
            low=mid+1;
    }
    if(low>hi)
        printf("Not found");
    getch();
}
```

Write a program to sort numbers stored in an array using bubble sort in ascending order.

```
#include<stdio.h>
#include<conio.h>
#define SIZE 100
void main()
{
    int a[SIZE],n,i,j,temp;
    clrscr();
    printf("How many numbers?");
    scanf("%d",&n);
    printf("Enter numbers:\n");
    for(i=0;i<n;i++)
        scanf("%d",&a[i]);
    for(i=0;i<n-1;i++)
        for(j=0;j<n-1-i;j++)
            if(a[j]>a[j+1])
            {
                temp=a[j];
                a[j]=a[j+1];
                a[j+1]=temp;
            }
}
```

```

        }
        printf("Sorted list is:\n");
        for(i=0;i<n;i++)
            printf("%d\n",a[i]);
        getch();
    }

```

Write a program to sort numbers stored in an array using bubble sort in descending order.

```

#include<stdio.h>
#include<conio.h>
#define SIZE 100
void main()
{
    int a[SIZE],n,i,j,temp;
    clrscr();
    printf("How many numbers?");
    scanf("%d",&n);
    printf("Enter numbers:\n");
    for(i=0;i<n;i++)
        scanf("%d",&a[i]);
    for(i=0;i<n-1;i++)
        for(j=0;j<n-1-i;j++)
            if(a[j]<a[j+1])
            {
                temp=a[j];
                a[j]=a[j+1];
                a[j+1]=temp;
            }
    printf("Sorted list is:\n");
    for(i=0;i<n;i++)
        printf("%d\n",a[i]);
    getch();
}

```

Write a program to read name list of 50 students and display them in alphabetical form.

```

#include<stdio.h>
#include<conio.h>
#include<string.h>
#define N 50
void main()
{
    char names[N][20],temp[20];
    int i,j;
    clrscr();
    printf("Enter name list of 50 students:\n");
    for(i=0;i<N;i++)
        gets(names[i]);
    for(i=0;i<N-1;i++)
        for(j=0;j<N-1-i;j++)

```

```

        if(strcmp(names[j],names[j+1])>0)
        {
            strcpy(temp,names[j]);
            strcpy(names[j],names[j+1]);
            strcpy(names[j+1],temp);
        }
    printf("Sorted list is:\n");
    for(i=0;i<N;i++)
        printf("%s\n",names[i]);
    getch();
}

```

Write a program to read a string and count the number of vowels and consonants in it.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    char str[20];
    int i=0,v=0,c=0;
    clrscr();
    printf("Enter a string:");
    gets(str);
    while(str[i]!='\0')
    {
        if(str[i]=='a' || str[i]=='e' || str[i]=='i' || str[i]=='o' || str[i]=='u')
            v++;
        else
            c++;
        i++;
    }
    printf("Number of vowels=%d\n",v);
    printf("Number of consonents=%d",c);
    getch();
}

```

Write a program to read a line of text and delete all the vowels from it.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    char str[50];
    int i=0,j;
    clrscr();
    printf("Enter a string:");
    gets(str);
    while(str[i]!='\0')
    {
        if(str[i]=='a' || str[i]=='e' || str[i]=='i' || str[i]=='o' || str[i]=='u')
        {

```

```

        j=i;
        while(str[j] != '\0')
        {
            str[j]=str[j+1];
            j++;
        }
        i--;
    }
    i++;
}
puts(str);
getch();
}

```

Write a program to check whether a given string is a palindrome or not.

```

#include<stdio.h>
#include<conio.h>
#include<string.h>
void main()
{
    char str1[20],str2[20];
    int i,j;
    clrscr();
    printf("Enter a string:");
    gets(str1);
    for(i=strlen(str1)-1,j=0;i>=0;i--,j++)
        str2[j]=str1[i];
    str2[j]='\0';
    if(strcmp(str1,str2)==0)
        printf("Palindrome");
    else
        printf("Not palindrome");
    getch();
}

```

Write a program to add two 3×2 matrices and print the result in matrix form.

```

#include<stdio.h>
#include<conio.h>
#define ROW 3
#define COL 2
void main()
{
    int a[ROW][COL],b[ROW][COL],i,j,sum;
    clrscr();
    printf("Enter elements of first matrix:\n");
    for(i=0;i<ROW;i++)
    {
        for(j=0;j<COL;j++)
            scanf("%d",&a[i][j]);
    }
}

```

```

        printf("\n");
    }
    printf("Enter elements of second matrix:\n");
    for(i=0;i<ROW;i++)
    {
        for(j=0;j<COL;j++)
            scanf("%d",&b[i][j]);
        printf("\n");
    }
    printf("Addition matrix is:\n");
    for(i=0;i<ROW;i++)
    {
        for(j=0;j<COL;j++)
        {
            sum=a[i][j]+b[i][j];
            printf("%d\t",sum);
        }
        printf("\n");
    }
    getch();
}

```

Write a program that accepts the elements of 3×3 matrix and calculate the sum of all elements of the matrix.

```

#include<stdio.h>
#include<conio.h>
#define ROW 3
#define COL 3
void main()
{
    int a[ROW][COL],i,j,sum=0;
    clrscr();
    printf("Enter elements of matrix:\n");
    for(i=0;i<ROW;i++)
    {
        for(j=0;j<COL;j++)
        {
            scanf("%d",&a[i][j]);
            sum=sum+a[i][j];
        }
        printf("\n");
    }
    printf("Sum=%d",sum);
    getch();
}

```

Write a program to read 4×4 matrix and find sum of each row.

```

#include<stdio.h>
#include<conio.h>

```

```

#define ROW 4
#define COL 4
void main()
{
    int a[ROW][COL],i,j,sum;
    clrscr();
    printf("Enter elements of matrix:\n");
    for(i=0;i<ROW;i++)
    {
        for(j=0;j<COL;j++)
            scanf("%d",&a[i][j]);
        printf("\n");
    }
    for(i=0;i<ROW;i++)
    {
        sum=0;
        for(j=0;j<COL;j++)
            sum=sum+a[i][j];
        printf("Sum of row %d=%d\n",i+1,sum);
    }
    getch();
}

```

Write a program to read two-dimensional matrix and display its transposed form.

```

#include<stdio.h>
#include<conio.h>
#define ROW 2
#define COL 3
void main()
{
    int a[ROW][COL],i,j;
    clrscr();
    printf("Enter elements of matrix:\n");
    for(i=0;i<ROW;i++)
    {
        for(j=0;j<COL;j++)
            scanf("%d",&a[i][j]);
        printf("\n");
    }
    printf("Original matrix:\n");
    for(i=0;i<ROW;i++)
    {
        for(j=0;j<COL;j++)
            printf("%d\t",a[i][j]);
        printf("\n");
    }
    printf("Transpose matrix:\n");
    for(i=0;i<COL;i++)
    {

```

```

        for(j=0;j<ROW;j++)
            printf("%d\t",a[j][i]);
        printf("\n");
    }
    getch();
}

```

Write a program to convert a 4×4 matrix to upper triangular and display the result in matrix form.

```

#include<stdio.h>
#include<conio.h>
#define ROW 4
#define COL 4
void main()
{
    int a[ROW][COL],i,j;
    clrscr();
    printf("Enter elements of matrix:\n");
    for(i=0;i<ROW;i++)
    {
        for(j=0;j<COL;j++)
            scanf("%d",&a[i][j]);
        printf("\n");
    }
    printf("Original matrix:\n");
    for(i=0;i<ROW;i++)
    {
        for(j=0;j<COL;j++)
            printf("%d\t",a[i][j]);
        printf("\n");
    }
    for(i=1;i<ROW;i++)
        for(j=0;j<i;j++)
            a[i][j]=0;
    printf("Upper traingular matrix:\n");
    for(i=0;i<ROW;i++)
    {
        for(j=0;j<COL;j++)
            printf("%d\t",a[i][j]);
        printf("\n");
    }
    getch();
}

```

Write a program to convert a 4×4 matrix to lower triangular and display the result in matrix form.

```

#include<stdio.h>
#include<conio.h>
#define ROW 4
#define COL 4
void main()

```

```

{
    int a[ROW][COL],i,j;
    clrscr();
    printf("Enter elements of matrix:\n");
    for(i=0;i<ROW;i++)
    {
        for(j=0;j<COL;j++)
            scanf("%d",&a[i][j]);
        printf("\n");
    }
    printf("Original matrix:\n");
    for(i=0;i<ROW;i++)
    {
        for(j=0;j<COL;j++)
            printf("%d\t",a[i][j]);
        printf("\n");
    }
    for(j=1;j<COL;j++)
        for(i=0;i<j;i++)
            a[i][j]=0;
    printf("Lower traingular matrix:\n");
    for(i=0;i<ROW;i++)
    {
        for(j=0;j<COL;j++)
            printf("%d\t",a[i][j]);
        printf("\n");
    }
    getch();
}

```

Write a program to multiply two rectangular matrices and display the resultant matrix.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int a[2][3],b[3][2],i,j,k,mul;
    clrscr();
    printf("Enter elements of first matrix:\n");
    for(i=0;i<2;i++)
    {
        for(j=0;j<3;j++)
            scanf("%d",&a[i][j]);
        printf("\n");
    }
    printf("Enter elements of second matrix:\n");
    for(i=0;i<3;i++)
    {
        for(j=0;j<2;j++)
            scanf("%d",&b[i][j]);
    }
}

```

```

        printf("\n");
    }
    printf("First matrix:\n");
    for(i=0;i<2;i++)
    {
        for(j=0;j<3;j++)
            printf("%d\t",a[i][j]);
        printf("\n");
    }
    printf("Second matrix:\n");
    for(i=0;i<3;i++)
    {
        for(j=0;j<2;j++)
            printf("%d\t",b[i][j]);
        printf("\n");
    }
    printf("Multiplication matrix:\n");
    for(i=0;i<2;i++){
        for(j=0;j<2;j++) {
            mul=0;
            for(k=0;k<3;k++)
                mul += a[i][k] * b[k][j];
            printf("%d\t",mul);
        }
        printf("\n");
    }
    getch();
}

```

Write a program to read n numbers in an array and display their sum and average. Use functions to read input and find sum and average.

```

#include<stdio.h>
#include<conio.h>
#define SIZE 100
int i;
void main()
{
    float a[SIZE], s, av;
    int n;
    void input(float a[], int);
    float sum(float a[], int);
    float avg(float a[], int);
    clrscr();
    printf("How many numbers?");
    scanf("%d", &n);
    printf("Enter numbers:\n");
    input(a, n);
    s = sum(a, n);
    av = avg(a, n);
}

```

```

        printf("Sum = %f\n", s);
        printf("Average = %f", av);
        getch();
    }
    void input(float a[], int n)
    {
        for(i=0;i<n;i++)
            scanf("%f",&a[i]);
    }
    float sum(float a[], int n)
    {
        float s = 0;
        for(i=0;i<n;i++)
            s = s + a[i];
        return s;
    }
    float avg(float a[], int n)
    {
        float av;
        av = sum(a, n) / n;
        return av;
    }
}

```

Write a program to add two 3×4 matrices and print the result in matrix form. Use separate functions to take input and to add and display the result.

```

#include<stdio.h>
#include<conio.h>
int i, j, c;
void main()
{
    int a[3][4], b[3][4];
    void input(int a[][4]);
    void add(int a[][4], int b[][4]);
    clrscr();
    printf("Input first matrix:\n");
    input(a);
    printf("Input second matrix:\n");
    input(b);
    printf("Addition matrix is:\n");
    add(a, b);
    getch();
}
void input(int a[][4])
{
    for(i=0;i<3;i++)
        for(j=0;j<4;j++)
            scanf("%d", &a[i][j]);
}
void add(int a[][4],int b[][4])

```

```

{
    for(i=0;i<3;i++)
    {
        for(j=0;j<4;j++)
        {
            c = a[i][j] + b[i][j];
            printf("%d\t", c);
        }
        printf("\n");
    }
}

```

Pointers

Write a program to swap two numbers using a function and by passing arguments as references.

```

#include<stdio.h>
#include<conio.h>
void main()
{
    int a, b;
    void swap(int*, int*);
    clrscr();
    printf("a = ");
    scanf("%d", &a);
    printf("b = ");
    scanf("%d", &b);
    swap(&a, &b);
    printf("a = %d\tb = %d", a, b);
    getch();
}
void swap(int *x, int *y)
{
    int t;
    t = *x;
    *x = *y;
    *y = t;
}

```

Write a program to read n numbers in an array and display their sum and average. Use the concept of pointer to access array elements.

```

#include<stdio.h>
#include<conio.h>
#define SIZE 100
void main()
{
    float a[SIZE], sum=0, avg;
    int n, i;
    clrscr();
    printf("How many numbers?");
    scanf("%d", &n);
    printf("Enter numbers:\n");
    for(i=0;i<n;i++)
    {
        scanf("%f", (a+i));
    }
}

```

```

        sum=sum + *(a+i);
    }
    avg = sum / n;
    printf("Sum=%f\n", sum);
    printf("Average=%f", avg);
    getch();
}

```

Using pointer write a program to get n integer number and display them in ascending order (use malloc or calloc to reserve memory).

```

#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
void main()
{
    int *a, n, i, j, *temp;
    clrscr();
    printf("How many numbers?");
    scanf("%d", &n);
    a = (int*)malloc(n * sizeof(int));
    //a = (int*)calloc(n, sizeof(int));
    printf("Enter numbers:\n");
    for(i = 0; i < n; i++)
        scanf("%d", (a+i));
    for(i = 0; i < n-1; i++)
        for(j = 0; j < n-1-i; j++)
            if(*(a+j) > *(a+j+1))
            {
                *temp = *(a+j);
                *(a+j) = *(a+j+1);
                *(a+j+1) = *temp;
            }
    printf("Sorted list is:\n");
    for(i=0;i<n;i++)
        printf("%d\n", *(a+i));
    getch();
}

```

Using pointer write a program to add two 3 × 2 matrices and print the result in matrix form.

```

#include<stdio.h>
#include<conio.h>
#define ROW 3
#define COL 2
void main()
{
    int a[ROW][COL],b[ROW][COL],i,j,sum;
    clrscr();
    printf("Enter elements of first matrix:\n");
    for(i=0;i<ROW;i++)
    {
        for(j=0;j<COL;j++)
            scanf("%d", (*(a+i)+j));
        printf("\n");
    }
}

```

```

printf("Enter elements of second matrix:\n");
for(i=0;i<ROW;i++)
{
    for(j=0;j<COL;j++)
        scanf("%d", (*(b+i)+j));
    printf("\n");
}
printf("Addition matrix is:\n");
for(i=0;i<ROW;i++)
{
    for(j=0;j<COL;j++)
    {
        sum = (*(a+i)+j)+*(b+i+j);
        printf("%d\t",sum);
    }
    printf("\n");
}
getch();
}

```

Write a program to search the given name among the list of names of n students using pointer.

```

#include<stdio.h>
#include<conio.h>
#include<string.h>
#include<stdlib.h>
#define LENGTH 20
void main()
{
    char **names, name[LENGTH];
    int n, i;
    clrscr();
    printf("Enter value of n:");
    scanf("%d",&n);
    printf("Enter names:\n");
    for(i=0;i<n;i++)
    {
        *(names+i)=(char*)malloc(LENGTH);
        scanf("%s",*(names+i));
    }
    printf("Enter name to search:");
    scanf("%s", name);
    for(i=0;i<n;i++)
    {
        if(strcmp(*(names+i),name) == 0)
        {
            printf("Found at location %d", i+1);
            break;
        }
    }
    if(i == n)
        printf("Not found");
    getch();
}

```

Structures and Unions

Write a program to read 100 students record with fields (roll no, name, class, and marks in 5 subjects) and display their records along with their percentage of marks obtained.

```
#include<stdio.h>
#include<conio.h>
#define NUM 100
void main()
{
    struct student
    {
        int roll_no;
        char name[20];
        int clas;
        int marks[5];
    };
    struct student s[NUM];
    int i, j, total;
    float percentage;
    clrscr();
    for(i = 0; i < NUM; i++)
    {
        printf("Enter data for student %d:\n", i+1);
        printf("Enter roll number:");
        scanf("%d", &s[i].roll_no);
        printf("Enter name:");
        scanf("%s", s[i].name);
        printf("Enter class:");
        scanf("%d", &s[i].clas);
        printf("Enter marks in five subjects:\n");
        for(j = 0; j < 5; j++)
            scanf("%d", &s[i].marks[j]);
    }
    for(i = 0; i < NUM; i++)
    {
        printf("\nStudent %d:\n", i+1);
        printf("Roll number: %d\n", s[i].roll_no);
        printf("Name: %s\n", s[i].name);
        printf("Class: %d\n", s[i].clas);
        printf("Marks in five subjects:\n");
        total = 0;
        for(j = 0; j < 5; j++)
        {
            printf("%d\n", s[i].marks[j]);
            total = total + s[i].marks[j];
        }
        percentage = (float)total / 5;
        printf("Percentage: %f\n", percentage);
    }
    getch();
}
```

Write a program to read 100 students record with following fields and display the record of BBA faculty only.

Roll No.	Name	Faculty	DOB (date of birth)		
			dd	mm	yy

```

#include<stdio.h>
#include<conio.h>
#include<string.h>
#define NUM 100
void main()
{
    struct dob
    {
        int dd;
        int mm;
        int yy;
    };
    struct student
    {
        int roll_no;
        char name[20];
        char faculty[10];
        struct dob date_of_birth;
    };
    struct student s[NUM];
    int i;
    clrscr();
    for(i = 0; i < NUM; i++)
    {
        printf("Enter data for student %d:\n", i+1);
        printf("Enter roll number:");
        scanf("%d", &s[i].roll_no);
        printf("Enter name:");
        scanf("%s", s[i].name);
        printf("Enter faculty:");
        scanf("%s", s[i].faculty);
        printf("Enter day:");
        scanf("%d", &s[i].date_of_birth.dd);
        printf("Enter month:");
        scanf("%d", &s[i].date_of_birth.mm);
        printf("Enter year:");
        scanf("%d", &s[i].date_of_birth.yy);
    }
    printf("\nStudent's record of BBA faculty only:\n");
    for(i = 0; i < NUM; i++)
    {
        if(strcmp(s[i].faculty,"BBA") == 0)
        {
            printf("Roll number: %d\n", s[i].roll_no);
            printf("Name: %s\n", s[i].name);
            printf("Faculty: %s\n", s[i].faculty);
            printf("Day: %d\n", s[i].date_of_birth.dd);
            printf("Month: %d\n", s[i].date_of_birth.mm);
            printf("Year: %d\n", s[i].date_of_birth.yy);
        }
    }
}

```

```

    }
    getch();
}

```

Create a structure to specify data on customer in a bank. The data to store is: Acc. No., Name, and Balance in account. Assume maximum of 200 customers in the bank.

- 1. Write a function to print the Ac. no. and name of each customer with balance below Rs. 100.**
- 2. If a customer gives a request for withdrawl or deposit it is given in the form: Acct. no., Amount (1 for deposit and 2 for withdrawl)**

Write a program to give a message “the balance is insufficient” for the specified withdrawl.

```

#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
#include<string.h>
#define TRUE 1
#define N 200
struct account
{
    int acct_no;
    char name[20];
    float balance;
};
int count = 0, i;
void main()
{
    struct account customer[N];
    void display(struct account customer[]);
    int choice, acct_no;
    char name[20];
    float amount;
    printf("1. Deposit\n");
    printf("2. Withdrawl\n");
    printf("3. Create account\n");
    printf("4. Customer with balance below Rs. 100\n");
    printf("5. Exit\n");
    while(TRUE)
    {
        printf("Enter a choice:");
        scanf("%d", &choice);
        switch(choice)
        {
            case 1:
                printf("Enter account number:");
                scanf("%d", &acct_no);
                printf("Enter name:");
                scanf("%s", name);
                for(i = 0; i < count; i++)
                {
                    if((customer[i].acct_no == acct_no) && (strcmp(customer[i].name,
name) == 0))
                    {
                        printf("Enter amount to deposit:");

```

```

scanf("%f", &amount);
customer[i].balance = customer[i].balance + amount;
break;
    }
}
if(i == count)
    printf("No match found\n");
break;
case 2:
    printf("Enter account number:");
    scanf("%d", &acct_no);
    printf("Enter name:");
    scanf("%s", name);
    for(i = 0; i < count; i++)
    {
        if((customer[i].acct_no == acct_no) && (strcmp(customer[i].name,
name) == 0))
        {
            printf("Enter withdrawl amount:");
            scanf("%f", &amount);
            if((customer[i].balance - amount) > 0)
                customer[i].balance -= amount;
            else
                printf("The balance is insufficient\n");
            break;
        }
    }
    if(i == count)
        printf("No match found\n");
    break;
case 3:
    printf("Enter account number:");
    scanf("%d", &customer[count].acct_no);
    printf("Enter name:");
    scanf("%s", customer[count].name);
    printf("Enter balance:");
    scanf("%f", &customer[count].balance);
    count++;
    break;
case 4:
    display(customer);
    break;
case 5:
    exit(0);
default:
    printf("Wrong choice!Try again\n");
}
}
}
void display(struct account customer[N])
{
    printf("\nCustomers with balance below Rs. 100:\n");
    for(i = 0; i < count; i++)

```

```

        {
            if(customer[i].balance < 100)
            {
                printf("Account number: %d\n", customer[i].acct_no);
                printf("Name: %s\n", customer[i].name);
            }
        }
    }
}

```

In a bank there are N customers with attributes name, account_no, and balance. Write a program to find out who has the highest balance in the bank.

```

#include<stdio.h>
#include<conio.h>
#define N 100
void main()
{
    struct account
    {
        int acct_no;
        char name[20];
        float balance;
    };
    struct account customer[N];
    float max_balance;
    int n, i, max_index;
    clrscr();
    printf("How many customers?");
    scanf("%d", &n);
    for(i = 0; i < n; i++)
    {
        printf("Enter data for customer %d:\n", i+1);
        printf("Enter account number:");
        scanf("%d", &customer[i].acct_no);
        printf("Enter name:");
        scanf("%s", customer[i].name);
        printf("Enter balance:");
        scanf("%f", &customer[i].balance);
    }
    max_balance = customer[0].balance;
    max_index = 0;
    for(i = 1; i < n; i++)
    {
        if(customer[i].balance > max_balance)
        {
            max_balance = customer[i].balance;
            max_index = i;
        }
    }
    printf("\nCustomer having highest balance:\n");
    printf("Account number: %d\n", customer[max_index].acct_no);
    printf("Name: %s\n", customer[max_index].name);
    printf("Balance: %f", customer[max_index].balance);
    getch();
}

```

Write a program using structure data to read name, roll, marks in three subjects of 20 students and print the record in the ascending order of the total marks obtained in three subjects.

```
#include<stdio.h>
#include<conio.h>
#define N 3
void main()
{
    struct student
    {
        char name[20];
        int roll_no;
        int marks[3];
    };
    struct student s[N], temp;
    int i, j, k, total1, total2;
    clrscr();
    for(i = 0; i < N; i++)
    {
        printf("Enter data for student %d:\n", i+1);
        printf("Enter name:");
        scanf("%s", s[i].name);
        printf("Enter roll number:");
        scanf("%d", &s[i].roll_no);
        printf("Enter marks in three subjects:\n");
        for(j = 0; j < 3; j++)
            scanf("%d", &s[i].marks[j]);
    }
    for(i = 0; i < N - 1; i++)
    {
        for(j = 0; j < N - 1 - i; j++)
        {
            total1 = total2 = 0;
            for(k = 0; k < 3; k++)
            {
                total1 += s[j].marks[k];
                total2 += s[j+1].marks[k];
            }
            if(total1 > total2)
            {
                temp = s[j];
                s[j] = s[j + 1];
                s[j + 1] = temp;
            }
        }
    }
    printf("Sorted list is:\n");
    for(i = 0; i < N; i++)
    {
        printf("Name: %s\n", s[i].name);
        printf("Roll no: %d\n", s[i].roll_no);
        printf("Marks in three subjects:\n");
        for(j = 0; j < 3; j++)
            printf("%d\n", s[i].marks[j]);
    }
}
```

```

    }
    getch();
}

```

File Handling

Write a program to read all numbers from the input file “values.dat” and store the average of these numbers in an output file named as “average.res”.

```

#include<stdio.h>
#include<conio.h>
#define NULL 0
void main()
{
    FILE *fpin, *fpout;
    float val, avg, sum = 0;
    int count = 0;
    fpin = fopen("values.dat", "r");
    if(fpin == NULL)
        printf("\nERROR - Cannot open the destination file\n");
    else
    {
        while(!feof(fpin))
        {
            fscanf(fpin, "%f", &val);
            sum = sum + val;
            count++;
        }
        avg = sum / count;
        fpout = fopen("average.res", "w");
        if(fpout == NULL)
            printf("\nERROR - Cannot open the destination file\n");
        else
            fprintf(fpout, "Average=%f", avg);
        fclose(fpin);
        fclose(fpout);
        getch();
    }
}

```

Create a file named “university.dat”. Write a program to keep the records on N colleges under Pokhara University if a file. These records contain name, location, and no_of_faculties of the college and display the names of colleges in Kathmandu location.

```

#include<stdio.h>
#include<conio.h>
#include<string.h>
#define NULL 0
void main()
{
    struct record
    {
        char name[30];
        char location[30];
        int no_of_faculty;
    };
    struct record college;
}

```

```

FILE *fp;
char ch;
clrscr();
fp = fopen("university.dat", "w+");
if(fp == NULL)
    printf("\nERROR - Cannot open the destination file\n");
else
{
    printf("Enter college information:\n");
    do
    {
        printf("Enter name:");
        scanf(" %[^\\n]", college.name);
        printf("Enter location:");
        scanf(" %[^\\n]", college.location);
        printf("Enter no of faculties:");
        scanf("%d", &college.no_of_faculty);
        fwrite(&college, sizeof(struct record), 1, fp);
        printf("Do you want to add another record?(y/n)");
        scanf(" %c", &ch);
    } while(ch != 'n');
    rewind(fp); //sets position indicator to the beginning
    fread(&college, sizeof(struct record), 1, fp);
    printf("Name of colleges in Kathmandu:\n");
    while(!feof(fp)) {
        if(strcmp(college.location, "Kathmandu") == 0)
            printf("%s\\n", college.name);
        fread(&college, sizeof(struct record), 1, fp);
    }
}
fclose(fp);
getch();
}

```

Create a file named “employee.dat”. Write a program to store records of N employee in a file. These records contain name, identification number, office name, and occupation of the employee. Also display name of those employees whose office name is “Everest Bank” and occupation is “manager”.

```

#include<stdio.h>
#include<conio.h>
#include<string.h>
#define NULL 0
void main()
{
    struct record
    {
        char name[30];
        int id;
        char office_name[30];
        char occupation[30];
    };
    struct record employee;
    FILE *fp;

```

```

char ch;
clrscr();
fp = fopen("employee.dat", "w+");
if(fp == NULL)
    printf("\nERROR - Cannot open the destination file\n");
else
{
    printf("Enter employee information:\n");
    do
    {
        printf("Enter name:");
        scanf(" %[^\\n]", employee.name);
        printf("Enter identification number:");
        scanf("%d", &employee.id);
        printf("Enter office name:");
        scanf(" %[^\\n]", employee.office_name);
        printf("Enter occupation:");
        scanf(" %[^\\n]", employee.occupation);
        fwrite(&employee, sizeof(struct record), 1, fp);
        printf("Do you want to add another record?(y/n)");
        scanf(" %c", &ch);
    } while(ch != 'n');
    rewind(fp); //sets position indicator to the beginning
    fread(&employee, sizeof(struct record), 1, fp);
    printf("Name of employees whose office name is Everest Bank and occupation is
manager:\n");
    while(!feof(fp)) {
        if((strcmp(employee.office_name, "Everest Bank") == 0) &&
(strcmp(employee.occupation, "manager") == 0))
            printf("%s\n", employee.name);
        fread(&employee, sizeof(struct record), 1, fp);
    }
}
fclose(fp);
getch();
}

```

Create a structure to specify data on customers in a bank with the parameters Acct. No., Name, Balance in Account. Assume there are 1000 customers in the bank. Write a program to store the data in "CUST.DAT" file and print the Acct. No. and Name of each customer with balance below Rs. 1000.

```

#include<stdio.h>
#include<conio.h>
#define NULL 0
void main()
{
    struct account
    {
        int acct_no;
        char name[20];
        float balance;
    };
    struct account customer;
}

```

```

FILE *fp;
char ch;
clrscr();
fp = fopen("CUST.DAT", "w+");
if(fp == NULL)
    printf("\nERROR - Cannot open the destination file\n");
else
{
    printf("Enter customer information:\n");
    do
    {
        printf("Enter account number:");
        scanf("%d", &customer.acct_no);
        printf("Enter name:");
        scanf(" %[^\\n]", customer.name);
        printf("Enter balance:");
        scanf("%f", &customer.balance);
        fwrite(&customer,sizeof(struct account),1,fp);
        printf("Do you want to add another record?(y/n)");
        scanf(" %c",&ch);
    } while(ch != 'n');
    rewind(fp); //sets position indicator to the beginning
    fread(&customer,sizeof(struct account),1,fp);
    printf("Acct. No. and Name of customers with balance below Rs. 100:\n");
    while(!feof(fp)) {
        if(customer.balance < 1000)
            printf("Acct. no: %d, Name: %s\n", customer.acct_no, customer.name);
        fread(&customer,sizeof(struct account),1,fp);
    }
}
fclose(fp);
getch();
}

```

Write a program to open a file named “student.txt” to keep the records of students (roll_no, name, course, and semester) in a write mode and perform the following operations:

- 1. Insert records in to the file.**
- 2. Display all those records for which course is BBA and semester is 2.**

```

#include<stdio.h>
#include<conio.h>
#include<string.h>
#define NULL 0
void main()
{
    struct record
    {
        int roll_no;
        char name[20];
        char course[10];
        int semester;
    };
    struct record student;
    FILE *fp;

```

```

char ch;
clrscr();
fp = fopen("student.txt", "w+");
if(fp == NULL)
    printf("\nERROR - Cannot open the destination file\n");
else
{
    printf("Enter student information:\n");
    do
    {
        printf("Enter roll number:");
        scanf("%d", &student.roll_no);
        printf("Enter name:");
        scanf(" %[^\\n]", student.name);
        printf("Enter course:");
        scanf(" %[^\\n]", student.course);
        printf("Enter semester:");
        scanf("%d", &student.semester);
        fwrite(&student, sizeof(struct record), 1, fp);
        printf("Do you want to add another record?(y/n)");
        scanf(" %c", &ch);
    } while(ch != 'n');
    rewind(fp); //sets position indicator to the beginning
    fread(&student, sizeof(struct record), 1, fp);
    printf("Students for which course is BBA and semester is 2:\n");
    while(!feof(fp)) {
        if((strcmp(student.course, "BBA") == 0) && (student.semester == 2))
        {
            printf("Roll no: %d\\n", student.roll_no);
            printf("Name: %s\\n", student.name);
            printf("Course: %s\\n", student.course);
            printf("Semester: %d\\n", student.semester);
        }
        fread(&student, sizeof(struct record), 1, fp);
    }
}
fclose(fp);
getch();
}

```

Write a program that creates a file named “employee.dat” to keep the records of N employees of a company and print the records in the ascending order of the employee_id. A typical employee record will be employee id, name, designation, and salary.

```

#include<stdio.h>
#include<conio.h>
#define NULL 0
void main()
{
    struct record
    {
        int employee_id;
        char name[20];
        char designation[20];
    }
}

```

```

        float salary;
    };
    struct record employee, t;
    struct record temp[100];
    FILE *fp;
    char ch;
    int count = 0, i, j;
    clrscr();
    fp = fopen("employee.dat", "w+");
    if(fp == NULL)
        printf("\nERROR - Cannot open the destination file\n");
    else
    {
        printf("Enter employee information:\n");
        do
        {
            printf("Enter id:");
            scanf("%d", &employee.employee_id);
            printf("Enter name:");
            scanf(" %[^\\n]", employee.name);
            printf("Enter designation:");
            scanf(" %[^\\n]", employee.designation);
            printf("Enter salary:");
            scanf("%f", &employee.salary);
            fwrite(&employee, sizeof(struct record), 1, fp);
            printf("Do you want to add another record?(y/n)");
            scanf(" %c", &ch);
        } while(ch != 'n');
        rewind(fp); //sets position indicator to the beginning
        fread(&employee, sizeof(struct record), 1, fp);
        while(!feof(fp)) {
            temp[count] = employee;
            count++;
            fread(&employee, sizeof(struct record), 1, fp);
        }
    }
    fclose(fp);
    for(i = 0; i < count - 1; i++)
    {
        for(j = 0; j < count - 1 - i; j++)
        {
            if(temp[j].employee_id > temp[j+1].employee_id)
            {
                t = temp[j];
                temp[j] = temp[j + 1];
                temp[j + 1] = t;
            }
        }
    }
    printf("Sorted list is:\n");
    for(i = 0; i < count; i++)
    {
        printf("Employee id: %d\n", temp[i].employee_id);
    }
}

```

```

        printf("Name: %s\n", temp[i].name);
        printf("Designation: %s\n", temp[i].designation);
        printf("Salary: %f\n", temp[i].salary);
    }
    getch();
}

```

Suppose a store has a number of items in their inventory and that each item is supplied by at most two suppliers. Create inventory and supplier files. Find the addresses of all suppliers who supply more than 10 different items. Discuss any changes in data structure you would suggest to simplify solving this problem.

```

#include<stdio.h>
#include<conio.h>
#define NULL 0
void main()
{
    struct supplier
    {
        int supplier_id;
        char supplier_name[20];
        char address[20];
    };
    struct item
    {
        int item_id;
        int supplier_id;
        char item_name[20];
        int qty;
    };
    struct supplier s;
    struct item i;
    FILE *fs, *fi;
    char ch;
    clrscr();
    fs = fopen("supplier.dat", "w+");
    fi = fopen("item.dat", "w+");
    if(fs == NULL)
        printf("\nERROR - Cannot open the destination file\n");
    else
    {
        printf("Enter supplier information:\n");
        do
        {
            printf("Enter supplier id:");
            scanf("%d", &s.supplier_id);
            printf("Enter supplier name:");
            scanf(" %[^\\n]", s.supplier_name);
            printf("Enter address:");
            scanf(" %[^\\n]", s.address);
            fwrite(&s, sizeof(struct supplier), 1, fs);
            printf("Do you want to add another record?(y/n)");
            scanf(" %c", &ch);
        } while(ch != 'n');
    }
}

```

```

}
if(fi == NULL)
    printf("\nERROR - Cannot open the destination file\n");
else
{
    printf("Enter item information:\n");
    do
    {
        printf("Enter item id:");
        scanf("%d", &i.item_id);
        printf("Enter supplier id:");
        scanf("%d", &i.supplier_id);
        printf("Enter item name:");
        scanf(" %[^\\n]", i.item_name);
        printf("Enter quantity:");
        scanf("%d", &i.qty);
        fwrite(&i,sizeof(struct item),1,fi);
        printf("Do you want to add another record?(y/n)");
        scanf(" %c",&ch);
    } while(ch != 'n');
}
getch();
}

```