ਜਗਤ ਗੁਰੂ ਨਾਨਕ ਦੇਵ
ਪੰਜਾਬ ਸਟੇਟ ਓਪਨ ਯੂਨੀਵਰਸਿਟੀ
ਪਟਿਆਲਾ

# JAGAT GURU NANAK DEV
# PUNJAB STATE OPEN UNIVERSITY, PATIALA

**(Established by Act No. 19 of 2019 of the Legislature of State of Punjab)**

## The Motto of the University
## (SEWA)

**SKILL ENHANCEMENT** **EMPLOYABILITY** **WISDOM**
**ACCESSIBILITY**




## DIPLOMA IN SOFTWARE DEVELOPMENT AND PROGRAMMING
## SEMESTER-I
## Course: Computer Programming Lab
## Course Code: CP-1-02P

**ADDRESS: C/28, THE LOWER MALL, PATIALA-147001**
**WEBSITE: www.psou.ac.in**

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# CP-1-02P: Computer Programming Lab

Total Marks: 50
External Marks: 35
Internal Marks: 15
Credits: 2
Pass Percentage: 40%

| **Course: Computer Programming Lab** | |
|---|---|
| **Course Code: CP-1-02P** | |
| **Course Outcomes (COs)**<br>After the completion of this course, the students will be able to: | |
| CO1 | Demonstrate proficiency in C/C++ programming by successfully designing, coding, and debugging Java applications to solve a variety of programming problems. |
| CO2 | Implement and manipulate fundamental data structures, such as arrays, linked lists, stacks, and queues, showcasing the ability to choose and apply appropriate data structures based on problem requirements. |
| CO3 | Apply object-oriented programming principles effectively, demonstrating the ability to design and implement classes, encapsulate data, utilize inheritance and polymorphism, and create reusable and modular code. |
| CO4 | Develop strong algorithmic problem-solving skills by designing and implementing efficient algorithms to solve programming challenges, demonstrating an understanding of algorithm complexity and optimization. |
| CO5 | Gain competence in error handling and debugging C/C++ code, utilizing debugging tools and techniques to identify and resolve errors effectively, thereby producing robust and error-free programs. |

## Detailed List of Programs:

| **Programme No.** | **Name of Program** |
|---|---|
| P1 | Write a simple program that prints "Hello, World!" to the console. |
| P2 | Take two numbers as input and display their sum. |
| P3 | Generate and print the multiplication table for a given number. |
| P4 | Compute the factorial of a given number. |
| P5 | Check whether a given number is prime or not. |
| P6 | Generate and display the Fibonacci series up to a specified number of terms. |
| P7 | Determine if a given number or string is a palindrome. |
| P8 | Reverse a given string without using library functions. |

| | |
|---|---|
| P9 | Implement a sorting algorithm (e.g., bubble sort, selection sort) for an array of integers. |
| P10 | Search for an element in an array using linear search. |
| P11 | Implement binary search for a sorted array. |
| P12 | Perform addition of two matrices. |
| P13 | Find and display the transpose of a matrix. |
| P14 | Implement a program to calculate the power of a number using recursion. |
| P15 | Create a basic calculator program that performs addition, subtraction, multiplication, and division. |
| P16 | Compute the factorial of a number using a recursive function. |
| P17 | Check whether a given number is an Armstrong number. |
| P18 | Calculate the GCD of two numbers using Euclidean Algorithm. |
| P19 | Convert a decimal number to its binary equivalent. |
| P20 | Reverse the words in a given sentence without using library functions. |

# Section A Solutions (C Language)

**1)** /* PROGRAM TO FIND THE AREA OF CIRCLE */

```
#include<stdio.h>
main()
{
    float r,area;
    clrscr();
    printf(" Enter the radius of the circle \n");
    scanf("%f",&r);
    area=3.142*r*r;
    printf(" The area of a circle =%f",area);
}
```

OUTPUT:

Enter the radius of the circle5

The area of a circle= 78.54999

**2)** /* PROGRAM TO FIND THE SIMPLE INTEREST*/

```
#include<stdio.h>
main ()
{
     float p,r,si;
     int t;
     clrscr();
     printf(" Enter the values of p,r, and t \n");
     scanf("%f%f%d",&p,&r,&t);
     si=(p*r*t)/100.0;
     printf("Amount=Rs. %5.2f \n",p);
     printf("Rate=Rs. %5.2f% \n",r);
     printf("Time=%d years \n",t);
     printf("Simple Interest=%5.2f \n",si);
}
```

OUTPUT:

Enter the values of p,r, and t
2000
8
3

Amount=Rs. 2000.00

Rate=Rs. 8.00%
Time=3 years
Simple Interest= 480.00

**3)** /* PROGRAM TO PERFORM ARITHMATIC OPERATOR'S */

```
#include<stdio.h>
#include<math.h>
main()
{
    int a,b,sum,sub,mult,div,rem;
    printf("Enter the values of a & b \n");
    scanf("%d%d",&a,&b);
    sum=a+b;
    sub=a-b;
    mult=a*b;
    div=a/b;
    rem=a%b;
    printf("The addition of two number's is %d \n",sum); printf("The
    subtraction of two number's is %d \n",sub); printf("The
    multiplication of two number's is %d \n",mult);printf("The division
    of two number's is %d \n",div); printf("The remainder of two
    number's is %d \n",rem); getch();
}
```

OUTPUT:

```
Enter the values of a & b
50 5
The addition of two number's is
55
The subtraction  of two number's is45
The multiplication of two number's is
250
The division of two number's is
10
The remainder of two number's is0
```

**4)** /* PROGRAM TO FIND AREA OF A TRIANGLE USING 3 SIDES */

```
#include<stdio.h>
#include<math.h>
main()
{
      int a,b,c,s;
      float area;
      printf(" Enter the values \n");
      scanf("%d%d%d",&a,&b,&c);s=(a+b+c)/2;
      area=sqrt(s*(s-a)*(s-b)*(s-c));
      printf(" The area of triangle is= %f",area);
}
```

OUTPUT:

```
Enter the values2
2
2

The area of triangle is= 1.7320
```

**5)** /* PROGRAM TO FIND THE LARGEST OF TWO NUMBERS */

```
#include<stdio.h>
main()
{
     int a,b,large;
     clrscr();
     printf(" Enter the two numbers \n");
     scanf("%d%d",&a,&b);
     large=a;
     if (b>large)
{
   large=b;
}
  printf("Largest of two numbers =%d \n",large);
  getch();
}
```

OUTPUT:

Enter the two numbers9
3

Largest of two numbers=9

**6)** /* PROGRAM TO FIND THE LARGEST OF FIVE NUMBERS */

```
#include<stdio.h>
main()
{
    int a,b,c,d,e,l;
    clrscr();
    printf(" Enter 5 numbers \n");
    scanf("%d%d%d%d%d",&a,&b,&c,&d,&e);l=a;
    if (l<b)
{
    l=b;
}
   if (l<c)
{
    l=c;
}
   if (l<d)
{
    l=d;
}

   if (l<e)
{
    l=e;
}
    printf(" The largest among these is : %d \n",l);
    getch();
}
```

OUTPUT:

Enter 5 numbers
6
3
9
5
1
The largest among these is: 9

**7)** /* PROGRAM TO FIND THE SMALLEST OF TWO NUMBERS USING CONDITIONAL OPERATOR*/

```
#include<stdio.h>
main()
{
        int a,b,s;
        clrscr();
        printf(" Enter the two numbers \n");
        scanf("%d%d",&a,&b);
        s=a>b?a:b;
        printf(" The smallest of 2 number's : %d \n",s);
 }
```

OUTPUT:

```
Enter the two numbers9
5
The smallest of 2 number's: 5
```

**8)** /* PROGRAM TO PERFORM THE SUM OF N NATURAL NUMBER */

```
#include<stdio.h>
main()
{
      int n,sum,i;
      clrscr();
      printf(" Enter the value of n \n");
      scanf("%d",&n);
      sum=0;
      i=1;
      do
      {
           sum=sum+i;
           i=i+1;
       }
       while (i<=n);
        printf("Sum of first %d number =%d",n,sum);
}
```

OUTPUT:

Enter the value of n4

Sum of first 4 number =1

**9)** /* PROGRAM TO PERFORM FACTORIAL OF A GIVEN NUMBER */

```
#include<stdio.h>
main()
{
      int n,fact,i;
      clrscr();
      printf(" Enter the value of n \n");
      scanf("%d",&n);
      fact=1; if
      (n==0)
     {
      printf("Factorial of %d is %d",n,fact);
     }
     else
     {
     for (i=1;i<=n;i++)
     {
       fact=fact*i;
     }
      printf("Factorial of %d is %d",n,fact);
    }
      getch();
}
```

OUTPUT:

Enter the value of n4
Factorial of 4 is 24

**10)** /* PROGRAM TO FIND THE GIVEN NUMBER IS PALINDROM OR NOT */

```
 #include<stdio.h>
main()
{
      int num,rem,sum,temp;
      clrscr();
      printf(" Enter any number \n");
      scanf("%d",&num);
      sum=0;
      temp=num;
      while(num>0)
      {
           rem = num % 10;
           sum = sum * 10 + rem;
           num = num /10;
       }
       if(tem = = sum)
      {
          printf("The given number is palindrome %d",sum);
       }
      else
      {
         printf("The given number is not palindrome %d",sum);
       }
     getch( );
}
```

OUTPUT:

```
 Enter any number
 121
  The given number is palindrome 121

  Enter any number
  234
  The given number is not palindrome 432
```

**11)** /* PROGRAM TO FIND THE GIVEN NUMBER IS ARMSTRONG OR NOT */

```
 #include<stdio.h>
main()
{
      int n,r,s,t;
      clrscr();
      printf(" Enter any number \n");
      scanf("%d",&n);
      s=0;
      t=n;
      while(n>0)
      {
           r = n % 10;
           s = s + (r * r * r);n
           = n /10;
       }
       if(t = = s)
      {
          printf("The given number %d is Armstrong ",s);
       }
      else
      {
         printf("The given number  %d is not Armstrong " ,s);
       }
     getch( );
}
```

OUTPUT:

```
 Enter any number
153
 The given number 153 is Armstrong

 Enter any number
 123
 The given number 123 is not Armstrong
```

**12)** /* PROGRAM TO REVERSE THE GIVEN NUMBER */

```
#include<stdio.h>
main()
{
      long int r,rev,n;
      clrscr();
      printf(" Enter any 4 digit  number \n");
      scanf("%ld",&n);
      rev=0;
       while(n ! = 0)
      {
           r = n % 10;
           rev = rev * 10 +r;
           n = n/10;
       }
          printf("The reverse of a given number is  %ld",rev);
     getch( );
}
```

OUTPUT:

```
Enter any 4 digit  number
1234
The reverse of given number is 4321
```

**13)** /* PROGRAM TO FIND SUM OF DIGITS */

```
#include<stdio.h>
main()
{
      int number, n, sum=0;
      clrscr();
      printf(" Enter a positive number \n");
      scanf("%d",&number);
       n=number;
       do
      {
           sum = sum+ n % 10;n
           = n/10;
       }
        while(n>0);
          printf("The sum of digits of %d is %d", number, sum);getch( );
}
```

OUTPUT:

Enter a positive number
12345
The sum of digits of 12345 is 15

**14)** /* PROGRAM TO FIND DAY OF THE WEEK */

```
#include<stdio.h>
main()
{
      int dayno;
      clrscr();
      printf("Input day number of the week \n");
      scanf("%d",&dayno);
      switch(dayno)
      {
           case 1: printf("Sunday \n");
                   break;
           case 2: printf("Monday \n");
                   break;
           case 3: printf("Tuesday \n");
                   break;
           case 4: printf("Wednesday \n");
                   break;
           case 5: printf("Thursday \n");
                   break;
           case 6: printf("Friday \n");
                   break;
          case 7: printf("Saturday \n");
                   break;
          default: printf("Invalid Input \n");
                   break;
        }
   getch();
}
```

OUTPUT:

Input day number of the week5
Thursday

**15)** /* PROGRAM TO FIND THE GIVEN CHARACTER IS VOWEL OR NOT */

```
# include<stdio.h>
 main()
 {
       char ch;
       clrscr();
       printf("Input a character \n");
       ch=getchar();
       if (ch=='a' || ch=='e' || ch=='i' || ch=='o' || ch=='u' || )
       {
         printf("The given character is vowel \n");
        }
       else
       {
         printf("The given character is not vowel \n");
        }
 getch();
 }
```

OUTPUT:

```
Input a characterA
The given character is vowel
 Input a characterB
The given character is not vowel
```

**16)** Program to compute their sum using function addnums()

```
#include<stdio.h>
Void main()

{

int
n1,n2,result;
clrscr();

printf("Enter the two
numbers");
scanf("%d%d",&n1,&n2);
result=addnums(n1,n2);

printf("The sum of %d and %d %d\n",n1,n2,result);
getch();          `

 }
```

```
intaddnums(val1,val2)
int val1,val2;

 {

int sum;
sum=val1+val2;
return sum;

 }
```

OUTPUT

```
 Enter the two
 numbers12

 23

 The sum of 12 and 23 is=35
```

**17)** Program to accept the two numbers and determine the largest among them.

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

{

floatx,y,max;

float large(float m,float n);
clrscr();

printf("Enter the two
numbers");
scanf("%f%f",&x,&y);
printf("x=%f and y=%f\n",x,y);
max=large(x,y);

printf("The largest=%f\n",max);
getch();

}

float large(float m,float n)

{
```

```
if(m>n)
return
m;else
return n;

}
```

OUTPUT

```
Enter the two
numbers10.0

20.0

x=10.000000 and y=20.000000

The largest=20.000000
```

**18)** Program to illustrate passing array as an argumunt to a called function

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

{

int a[6];
int i;

voidarrpass(int a[]);
clrscr();

printf("Enter array
elemnts\n");for(i=0;i<5;i++)

 {

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

 }

arrpass(a)
;getch();

}
```

```
voidarrpass(int a[])

{

int i;

printf("Array elements
are\n");for(i=0;i<5;i++)

 {

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

 }

}
```

OUTPUT

```
Enter array
elemnts1

2

3

4

5


Array elements
are1

2

3

4

5
```

**19)** Program to accept three sides of a triangle and pass them to a function to computethe area of a triangle

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

{

float side1,side2,side3,area;
floattri_area(); /* Function Declaration
*/clrscr();

printf("Enter the three sides of a
triangle\n");
scanf("%f%f%f",&side1,&side2,&side3);
area=tri_area(side1,side2,side3);

printf("The area of the
triangle=%f\n",area);getch();

}

/* Function to compute the area of triangle
*/floattri_area(a,b,c)

floata,b,c;

{

floats,area;
  s=(a+b+c)/2;

area=sqrt(s*(s-a)*(s-b)*(s-c));
return area;

}
```

OUTPUT

```
Enter the three sides of a
triangle3.0

4.0

5.0
```

The area of the triangle=6.000000

**20)** Program to illustrate a call by value parameter passing mechanism.

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

{

int n1,n2,x;
intcal_by_val(int p1,int p2);
clrscr();

 n1=6;
 n2=9;

printf("n1=%d and n2=%d\n",n1,n2);
 x=cal_by_val(n1,n2);

printf("n1=%d and n2=%d\n",n1,n2);
printf("x=%d\n",x);

getch();

}

intcal_by_val(int p1,int p2)

{

int sum;
sum=p1+p2;
p1+=2;

 p2*=p1;

printf("p1=%d and p2=%d\n",p1,p2);
return sum;

}
```

OUTPUT

```
n1=6 and n2=9
p1=8 and p2=72
n1=6 and n2=9
x=15
```

**21)** Program to accept two positive integers and compute their GCD using recursive function.

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

{

inta,b,gcd;

int GCD(intx,int y);

printf("Enter the value of A and B");
scanf("%d%d",&a,&b);
gcd=GCD(a,b);

printf("The GCD of %d and %d =%d\n",a,b,gcd);
getch();

}

int GCD(intx,int y)

{

int  rem;
if(y==0)
return
x;else

 {

rem=x%y;
return(GCD(y,rem));

 }

}
```

OUTPUT

```
Enter the value of A and B
12

8
The GCD of 12 and 8 =4
```

**22)** Program to accept a number from the keyboard and compute its factorial byrecursive function.

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

{

intnum,fact;
intrec_funct(int N);
clrscr();

printf("Enter a
number\n");
scanf("%d",&num);
fact=rec_funct(num);

printf("factorial of %d=%d\n",num,fact);
getch();

}

intrec_funct(int N)

{

intfct;
if(N==0)

return
1;else

fct=N*rec_funct(N-1);
returnfct;

}
```

OUTPUT

```
Enter a
number5

factorial of 5=120
```

**23)** Program to accept the information of a C_book such as number, author, publisherand price and also display it.

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

{

struct C_BOOK

 {

intbook_num;
char author[20];
char publish[20];
float price;

 };

struct C_BOOK bkinfo;
clrscr();

printf("Enter the book number\n");
scanf("%d",&bkinfo.book_num);
printf("Enter the Name of the
author\n");scanf("%s",bkinfo.author);

printf("Enter the name of the
publisher\n");scanf("%s",bkinfo.publish);

printf("Enter the price of the
book\n");scanf("%f",&bkinfo.price);

printf("_____
_____\n");printf("         C_BOOK
                  \n");

printf("_____
_____\n");printf("Book Number :
%d\n",bkinfo.book_num);printf("Author
                  : %s\n",bkinfo.author);
printf("Publisher    : %s\n",bkinfo.publish);
printf("Price    :  Rs.%6.2f\n",bkinfo.price);
```

```
printf("
_____\n")
;getch();

}
```

OUTPUT

```
Enter the book
number12345

Enter the Name of the
authorkottur

Enter the name of the
publishersapna

Enter the price of the
book200.00
```

```
_____
        C_BOOK

_____
Book Number  : 12345
Author       : kottur
Publisher    : sapna
Price        : Rs.200.00
```

_____

**24)** Program to accept the roll number, name, marks obtained in three tests oftwo students of a class and display the rollnum, name marks and their average.

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

{

structstud_rec

 {

intRollno;
```

```
char Name[20];
int M1;

int    M2;
int    M3;
floatavg;

 };

inti,total;

structstud_rec student[2];

printf("Type in information of 2
students\n");for(i=0;i<2;i++)

 {

printf("Enter the rollno of
student%d=\n",i+1);
scanf("%d",&student[i].Rollno);

printf("Enter the nameof the student
%d=\n",i+1);scanf("%s",student[i].Name);

printf("Enter                the
marks1\n");
scanf("%d",&student[i].M1);
printf("Enter                the
marks2\n");
scanf("%d",&student[i].M2);
printf("Enter                the
marks3\n");
scanf("%d",&student[i].M3);

 }

printf("_____\n");
printf("Rollno Name Mark1 Mark2 Mark3 Average \n"):

printf("
_____\n")
;for(i=0;i<2;i++)

{
```

```
total=student[i].M1+student[i].M2+student[i].M3;student[i].avg=total/3.0;
printf("%d%s%d%d%d%5.2f\n",student[i].Rollno,student[i].Name,student[i].M1,student[i].
M2,student[i].M3,student[i].avg);

}

printf("
_____\n")
;getch();

}
```

OUTPUT

```
Type in information of 2
studentsEnter the rollno of
student 1=

1

Enter the name of the student
1=abhi

Enter the
marks180

Enter the
marks290

Enter the
marks380

Enter the rollno of student
2=2

Enter the name of the stydent
2=akash

Enter the
marks170

Enter the
marks280

Enter the
marks360
```

```
_____________________________________________
Rno  Name  Mark1  Mark2  Mark3  Average

_____________________________________________
1   abhi    80     90    80    83.33

2   akash   70     80    60    70.00

_____________________________________________
```

**25)** Program to find the sum of statically declared 5 elements.Thisprogram makes useof the concept of pointers (pass_by reference) and function.

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

{

staticint array[5]={200,400,600,800,1000};
intaddnum(int *ptr);

int sum;
sum=addnum(array)
;

printf("Sum of all array elements=%d\n",sum);
getch();

}

intaddnum(int *ptr)

{

inti,total=0;
for(i=0;i<5;i++)
total=total+*(ptr+i);
Return(total);

}
```

OUTPUT

```
Sum of all array elements=3000
```

**26)** Program to illustrate the call_by_value method to interchange the contents of two integer variable

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

{

inta,b;
 a=10;b=20;

clrscr();

printf("\n The main before
exchanging");printf("\n a=%d and
b=%d\n",a,b); exchang(a,b);

printf("\n The main after
exchanging");printf("\n a=%d and
b=%d\n",a,b); getch();

}

voidexchang(intm,int n)

{

int temp;

printf("\n Function before exchanging
\n");printf("\n m=%d and n=%d\n",m,n);
temp=m;

 m=n;
 n=temp
 ;

printf("\n The function after
exchanging\n");printf("\n m=%d and
n=%d\n", m,n);

}
```

OUTPUT

The main before exchanging
a=10 and b=20

Function before exchanging

m=10 and n=20

The function after exchanging

m=20 and n=10

The main after exchanging

a=10 and b=20

**27)** Program to create a file called emp.rec and store information about person, in terms of his name, age and salary.

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

{

 FILE *fptr;
char
name[20];int
age;

float salary;
clrscr();

fptr=fopen("emp.rec","w");
if(fptr==NULL)

  {

printf("File doesnot exist
\n");return;

  }

printf("Enter the name \n");
scanf("%s",name);
fprintf(fptr,"Name=%s\n",name);
printf("Enter the age\n");
scanf("%d",&age);
fprintf(fptr,"Age =%d\n",age);
printf("Enter the salary \n");
scanf("%f",&salary);

fprintf(fptr,"Salary = %2.2f\n",salary);
fclose(fptr);

getch();

}
```

OUTPUT

```
Enter the
namemadhu

Enter the
age30

Enter the
salary40000

Emp.rec


Name=madh
uAge =30

Salary = 40000.00
```

**28)** Program to illustrate the function fputc() and fputs() to write a single charatcterand string to a data file.

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

{

  FILE *fptr;
charmychar;
char string[20];
clrscr();

fptr=fopen("out.txt","w");
if(fptr==NULL)

  {

printf("File doesnot Exist \n");
return;

  }

printf("Enter a character
\n");scanf("%c",&mychar);
```

```
fputc(mychar,fptr);
fflush(stdin);

printf("Enter a string
\n");gets(string);
fputs(string,fptr);
fclose(fptr);

getch();

}
```

OUTPUT

```
Enter a
characterh

Enter a string
hello

out.txt

hello
```

**29)** Program To Draw a Line Using graphics.

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

{

inta,b;
detectgraph(&a,&b);
initgraph(&a,&b,"");

line(75,50,150,50);

getch();
closegraph();

}
```

OUTPUT:

---

**30)** Program To Draw a Circle Using graphics.

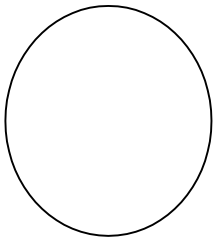
```
#include<stdio.h>
#include<graphics.h>
#include<math.h>
void main()

{

inta,b;
detectgraph(&a,&b)
;
initgraph(&a,&b,"");
circle(100,120,75);
getch();
closegraph();

}
```

OUTPUT



## Section B: Experiments using C++ Languages

1. **Write a C++ Program to display Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, Roll No. and grade. Create an array of class objects. Read and display the contents of the array.**

```
#include <iostream> using namespace std; #define MAX 10
class student
{
private:
char name[30]; int rollNo;
int total; float perc;
public:
void getDetails(void);                  //member function to get student's details void
putDetails(void);     //member function to print student's details
};

void student:: getDetails(void)     //member function definition, outside of the class
{
cout << "Enter name: " ; cin >> name;
cout << "Enter roll number: "; cin >> rollNo;
cout << "Enter total marks outof 500: "; cin >> total;
perc=(float)total/500*100;
}

void student:: putDetails(void)     //member function definition, outside of the class
{
cout << "Student details:\n";
cout << "Name:"<< name << ",Roll Number:" << rollNo << ",Total:" << total <<
",Percentage:" << perc;

}

int main()
{
student std[MAX];  //array of objects creation int n,loop;
cout << "Enter total number of students: "; cin >> n;
for (loop=0;loop< n; loop++)
{
cout << "Enter details of student " << loop+1 << ":\n"; std[loop].getDetails();
}
cout << endl; for(loop=0;loop< n; loop++)
{
```

```
cout << "Details of student " << (loop+1) << ":\n"; std[loop].putDetails();
}
return 0;
}
```

**Output:**

Enter total number of students: 3 Enter details of student 1:
Enter name: Karthik Enter roll number: 1201
Enter total marks out of 500: 456

Enter details of student 2:
Enter name: Mahesh Enter roll number: 1202
Enter total marks out of 500: 398

Enter details of student 3:
Enter name: Kiran Enter roll number: 1203
Enter total marks out of 500: 456

Details of student 1:
Student details:
Name: Karthik, Roll Number: 101, Total: 456, Percentage: 91.2 Details of student 2:

Student details:
Name: Mahesh, Roll Number: 1202, Total: 398, Percentage:79.6

Details of student 3:
Student details:
Name: Kiran, Roll Number: 1203, Total: 398, Percentage:79.6

**2. Write a C++ program to declare Struct. Initialize and display contents of member variables.**

```
#include <iostream> using namespace std; struct student
{
char name[50]; int roll;
float marks;
};
int main()
{
student s;
cout << "Enter information," << endl; cout << "Enter name: ";
```

```
cin >> s.name;
cout << "Enter roll number: "; cin >> s.roll;
cout << "Enter marks: "; cin >> s.marks;
cout << "\nDisplaying Information," << endl; cout << "Name: " << s.name << endl;
cout << "Roll: " << s.roll << endl; cout << "Marks: " << s.marks << endl; return 0;
}
```

**Output:**

```
Enter information, Enter name: Bill Enter roll number: 4 Enter marks: 55.6
Displaying Information, Name: Bill
Roll: 4
Marks: 55.6
```

2. **Write a C++ program to declare a class. Declare pointer to class. Initialize and display the contents of the class member.**

```
#include <iostream> using namespace std;
class Box
{
public:
Box(double l = 2.0, double b = 2.0, double h = 2.0)
{
cout <<"Constructor called." << endl; length = l;
breadth = b; height = h;
}
double Volume()
{
return length * breadth * height;
}
private:
double length; double breadth; double height;
};

int main(void)
{
Box Box1(3.3, 1.2, 1.5);
Box Box2(8.5, 6.0, 2.0);
Box *ptrBox; ptrBox = &Box1;
cout << "Volume of Box1: " << ptrBox->Volume() << endl; ptrBox = &Box2;
cout << "Volume of Box2: " << ptrBox->Volume() << endl; return 0;
}
```

**Output:**

Constructor called. Constructor called. Volume of Box1: 5.94 Volume of Box2: 102

**4. Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members.**

```
#include<iostream.h> #include<conio.h> class employee
{
int  emp_num;
char emp_name[20]; float emp_basic; float sal;
float emp_da; float net_sal; float emp_it; public:
void get_details(); void find_net_sal();
void show_emp_details();
};
void employee :: get_details()
{
cout<<"\n Enter employee number:\n"; cin>>emp_num;
cout<<"\n Enter employee name:\n"; cin>>emp_name;
cout<<"\n Enter employee basic:\n"; cin>>emp_basic;
}
void employee :: find_net_sal()
{
emp_da=0.52*emp_basic; emp_it=0.30*(emp_basic+emp_da);
net_sal=(emp_basic+emp_da)-emp_it;
}

void employee :: show_emp_details()
{
cout<<"\n\n\n Details of  : "<<emp_name;


cout<<"\n\n Employee number:   "<<emp_num; cout<<"\n Basic salary    : "<<emp_basic;
cout<<"\n Employee DA                  : "<<emp_da; cout<<"\n Income Tax             :
"<<emp_it; cout<<"\n Net Salary          : "<<net_sal;
}
int main()
{
employee emp[10]; int i,num;
clrscr();
cout<<"\n Enter number of employee details\n"; cin>>num;
for(i=0;i<num;i++)
emp[i].get_details(); for(i=0;i<num;i++)
emp[i].find_net_sal(); for(i=0;i<num;i++)
emp[i].show_emp_details(); getch();
```

```
return 0;
}
```
**Output:**

Enter number of employee details Enter employee number: 5123 Enter employee name: Madhav Enter employee basic: 10000

Details of : Madhav Employee number: 5123 Basic salary : 10000
Employee DA : 5200 Income Tax : 4560 Net Salary : 10640

**5. Write a C++ program to read the data of N employee and compute Net salary of each employee (DA=52% of Basic and Income Tax (IT) =30% of the gross salary).**

```
#include<iostream.h> #include<conio.h> #define SIZE 5
class emp
{
float basic,da,it,netsal; char name[20],num[10]; public:
void getdata(); void net_sal(); void dispdata();
};
void emp::getdata()
{
cout<<"\n Enter employee number: " ; cin>>name;
cout<<"\n Enter employee name: " ; cin>>num;
cout<<"Enter employee basic salary in Rs: " ; cin>>basic;
}
void emp::net_sal()
{
da=((0.52)*basic ); float gsal=da+basic; it=((0.3)*gsal); netsal=gsal-it;
}

void emp::dispdata()
{
cout <<"\n Employee number: "<<name cout <<"\n Employee name: "<<num
cout <<"\n Employee netsalary: "<<netsal<<" Rs.";
}
void main()
{
clrscr();


emp ob[SIZE]; int n;
cout<<"\n\n**********************************"
<<"\n Calculation of Employee Net Salary"
```

```
<<"\n**********************************"
<<"\n Enter the number of employees"; cin>>n;
for(int i=0;i<n;i++)
{
ob[i].getdata();
ob[i].net_sal();
}
clrscr();
cout<<"\n     "
<<"\n Employee Detail::"
<<"\n ";
for( i=0;i<n;i++)
{
cout<<"\n\n Employee:"<<i+1
<<"\n ";
ob[i].dispdata();
}
getch();
}
```

**Output:**

********** Calculation of Employee Net Salary
********** Enter the number of employees: 1

Enter employee number: 22 Enter employee name: Sanath
Enter employee basic salary in Rs: 10000
Employee Detail::
Employee:1 Employee number: 22
Employee name: Sanath Employee netsalary: 10000 RS.

**6. Write a C++ to illustrate the concepts of console I/O operations.**

```
#include <iostream> #include <fstream> #include <cstdlib> #include <string> using
namespace std;
int main()
{
string filename = "test.txt";
ofstream fout(filename.c_str()); // default mode is ios::out | ios::trunc

if (!fout)
{
cerr << "error: open file for output failed!" << endl; abort(); // in <cstdlib> header
}
```

```
fout << "apple" << endl; fout << "orange" << endl; fout << "banana" << endl; fout.close();
ifstream fin(filename.c_str()); // default mode ios::in
if (!fin)
{
cerr << "error: open file for input failed!" << endl; abort();
}
char ch;

while (fin.get(ch))
{ // till end-of-file cout << ch;
}
fin.close(); return 0;
}
```

**Output:**
apple orange banana

**7. Write a C++ program to use scope resolution operator. Display the various values of the same variables declared at different scope levels.**

```
#include <iostream> using namespace std;
class programming
{
public: void output(); //function declaration
};
void programming::output()
{
cout << "Function defined outside the class.\n";
}

int main()
{
programming x; x.output(); return 0;
}
```

**Ouput:**
Function defined outside class

**8. Write a C++ program to allocate memory using new operator.**

```
#include <iostream> using namespace std;
int main ()
{
int* p = NULL;
p = new(nothrow) int; if (!p)
cout << "allocation of memory failed\n"; else
{
*p = 29;
cout << "Value of p: " << *p << endl;
}
float *r = new float(75.25);
cout << "Value of r: " << *r << endl; int n = 5;
int *q = new(nothrow) int[n];

if (!q)
cout << "allocation of memory failed\n"; else
{
for (int i = 0; i < n; i++) q[i] = i+1;
cout << "Value store in block of memory: "; for (int i = 0; i < n; i++)
cout << q[i] << " ";
}
delete p; delete r; delete[] q;
return 0;
}
```

**Output:**

Value of p: 29 Value of r: 75.25
Value store in block of memory: 1 2 3 4 5

**9. Write a C++ program to create multilevel inheritance. (Hint: Classes A1, A2, A3)**

```
#include <iostream> using namespace std;
class base //single base class
{
public:
int x;
void getdata()
{
cout << "Enter value of x= "; cin >> x;
}
```

```
};

class derive1 : public base // derived class from base class
{
public:
int y;
void readdata()
{
cout << "\nEnter value of y= "; cin >> y;
}
};

class derive2 : public derive1  // derived from class derive1
{
private:
int z; public:
void indata()
{
cout << "\nEnter value of z= "; cin >> z;
}
void product()
{
cout << "\nProduct= " << x * y * z;
}
};
int main()
{
derive2 a; a.getdata();
a.readdata();
a.indata();
a.product(); return 0;
}
```

**Output:**

Enter value of x= 2 Enter value of y= 3 Enter value of z= 3 Product= 18

**10. Write a C++ program to create an array of pointers. Invoke functions using array objects.**

```
#include<iostream.h> #include<constream.h>
class A
{
public:
virtual void show()
{
cout<<“A\n”;
}
};

class B : public A
{
public:
void show()
{
cout<<“B\n”;
}
};

class C : public A
{
public:
void show()
{
cout<<“C\n”;
}
};


class D : public A
{
public:
void show()
{
cout<<“D\n”;
}
};
```

```
class E : public A
{
public:
void show()
{
cout<<“E”;
}
};

void main()
{
clrscr();
A a;
B b;
C c;
D d;
E e;
A *p a[]={&a,&b,&c,&d,&e}; for ( int j=0;j<5;j++)
pa[j]->show();
}
```

Output:
A B C D E

**11. Write a C++ program to use pointer for both base and derived classes and call the member function. Use Virtual keyword.**

```
#include<iostream> using namespace std; class base
{
public:
virtual void print ()
{
cout<< "print base class" <<endl;
}
void show ()
{
cout<< "show base class" <<endl;
}
};
class derived: public base
{
public:
```

```
void print ()
{
cout<< "print derived class" <<endl;
}
void show ()
{
cout<< "show derived class" <<endl;
}
};
int main()
{
base *bptr; derived d; bptr = &d; bptr->print(); bptr->show();
}
```

**Output:**

print derived class show base class