मौलाना आज़ाद राष्ट्रीय प्रौद्योगिकी संस्थान, भोपाल – 462003
MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY BHOPAL – 462003

कंप्यूटर विज्ञान एवं अभियांत्रिकी विभाग
(Department of Computer Science and Engineering)

प्रयोग सूची (Lab Manual)

सीएसई- द्वितीय वर्ष /चतुर्थ सेमेस्टर (CSE- II Year / IV Semester)

सत्र:जनवरी-जून, २०२५ (Session: Jan-April, 2025)

प्रिंसिपल प्रोग्रामिंग लैंग्वेज (सीएसई-217) / Principle Programming Language (CSE-217)

Lab: 01

1. **समस्या विवरण:** एरे के एलिमेंट्स को रिवर्स करने के लिए।

Problem Statement: To reverse the elements of an array.

Code:

```
#include <iostream>
using namespace std;
int main()
{
   const int MAX_SIZE = 20;
   int a[MAX_SIZE], b[MAX_SIZE], n;
   cout << "\n\t\tEnter number of elements in array (up to " << MAX_SIZE << "): ";
   cin >> n;
   if (n > MAX_SIZE || n <= 0) {
      cout << "Invalid input. Number of elements should be between 1 and " << MAX_SIZE
<< ".\n";
      return 1;
   }
   cout << "\n\t\tEnter " << n << " elements: ";
   for (int i = 0; i < n; i++)
   {
      cin >> a[i];
   }
   for (int i = 0; i < n; i++)
   {
      b[i] = a[n - i - 1];
   }
   cout << "\n\t\tThe array elements after reversing: ";
   for (int i = 0; i < n; i++)
```

```
    {
       cout << b[i] << " ";
    }

    cout << "\n\n";
    return 0;
}
```

```
                Enter number of elements in array (up to 20): 5

                Enter 5 elements: 1
2
3
6
5

                The array elements after reversing: 5 6 3 2 1


...Program finished with exit code 0
Press ENTER to exit console.
```

---

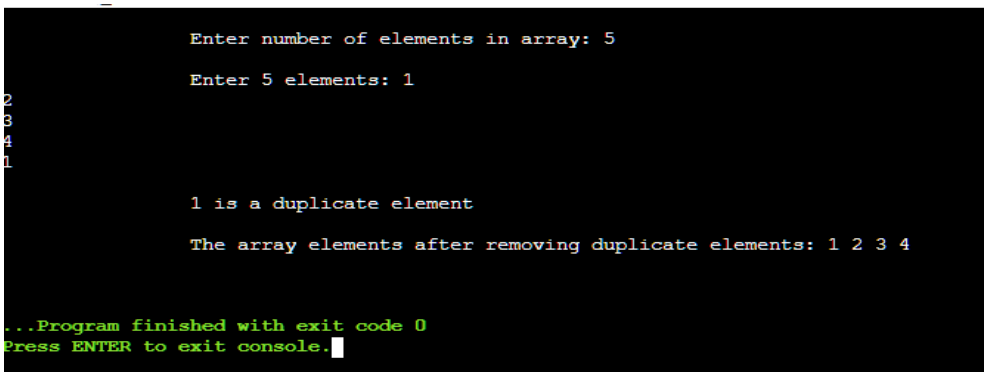
2. **समस्या विवरण:** एक ऐरे से डुप्लिकेट एलिमेंट्स को खोजना और फिर उन्हें हटाना।

Problem Statement: To find duplicate elements from an array and then remove them.

Code

```
#include <iostream>
using namespace std;

int main()
{
```

```
int n, a[20], i, j, k;

cout << "\n\t\tEnter number of elements in array: ";
cin >> n;

cout << "\n\t\tEnter " << n << " elements: ";
for (i = 0; i < n; i++)
{
   cin >> a[i];
}

for (i = 0; i < n; i++)
{
   for (j = i + 1; j < n; j++)
   {
      if (a[i] == a[j])
      {
         cout << "\n\t\t" << a[i] << " is a duplicate element ";
         for (k = j; k < n - 1; k++)
         {
            a[k] = a[k + 1];
         }
         n--;
         j--;
      }
   }
}

cout << "\n\t\t\n\t\tThe array elements after removing duplicate elements: ";
for (i = 0; i < n; i++)
{
   cout << a[i] << " ";
}

cout << "\n\n";
return 0;
}
```



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3. **समस्या विवरण:** दो एरे को जोड़कर प्राप्त एरे को सॉर्ट करने के लिए।

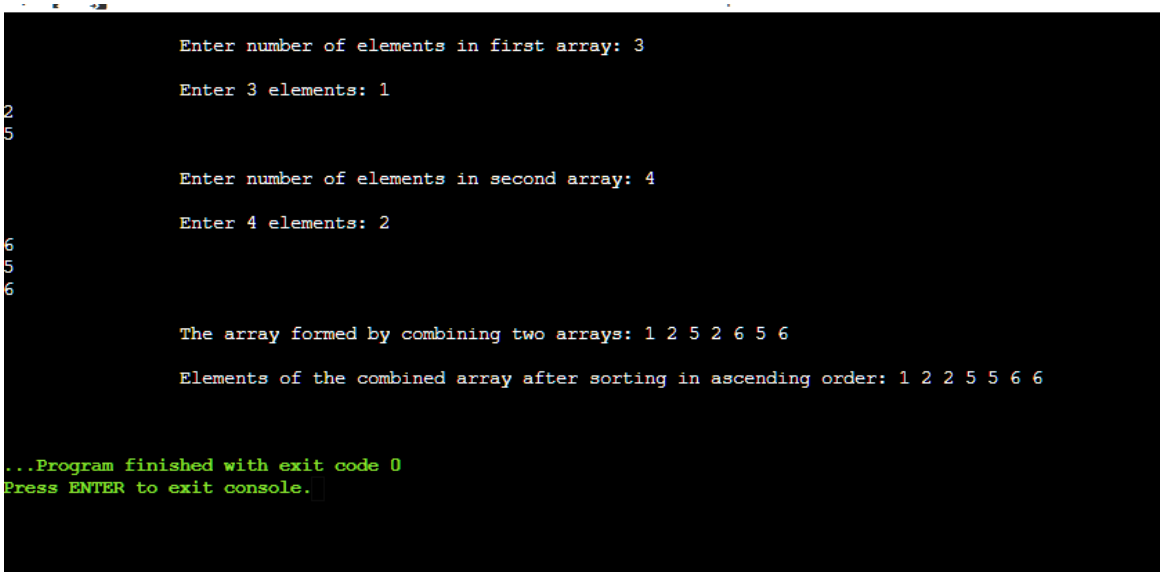
Problem Statement: To combine two arrays and then sorting the combined array.

Code:

```
#include <iostream>
using namespace std;

int main()
{
   int a[20], b[20], c[40], i, j, k, n, m, temp = 0;

   cout << "\n\t\tEnter number of elements in first array: ";
   cin >> n;

   cout << "\n\t\tEnter " << n << " elements: ";
   for (i = 0; i < n; i++)
   {
      cin >> a[i];
   }

   cout << "\n\t\tEnter number of elements in second array: ";
   cin >> m;

   cout << "\n\t\tEnter " << m << " elements: ";
   for (i = 0; i < m; i++)
   {
```

```
    cin >> b[i];
}

j = 0;
k = 0;
for (i = 0; i < n + m; i++)
{
    if (i < n)
    {
        c[i] = a[k];
        k++;
    }
    else
    {
        c[i] = b[j];
        j++;
    }
}

cout << "\n\t\tThe array formed by combining two arrays: ";
for (i = 0; i < n + m; i++)
{
    cout << c[i] << " ";
}

// Bubble Sort to sort the combined array in ascending order
for (i = 0; i < n + m; i++)
{
    for (j = i + 1; j < n + m; j++)
    {
        if (c[i] > c[j])
        {
            temp = c[i];
            c[i] = c[j];
            c[j] = temp;
        }
    }
}

cout << "\n\t\t\n\t\tElements of the combined array after sorting in ascending order: ";
for (i = 0; i < n + m; i++)
{
    cout << c[i] << " ";
```

```
    }

    cout << "\n\n";
    return 0;
}
```



Lab: 02

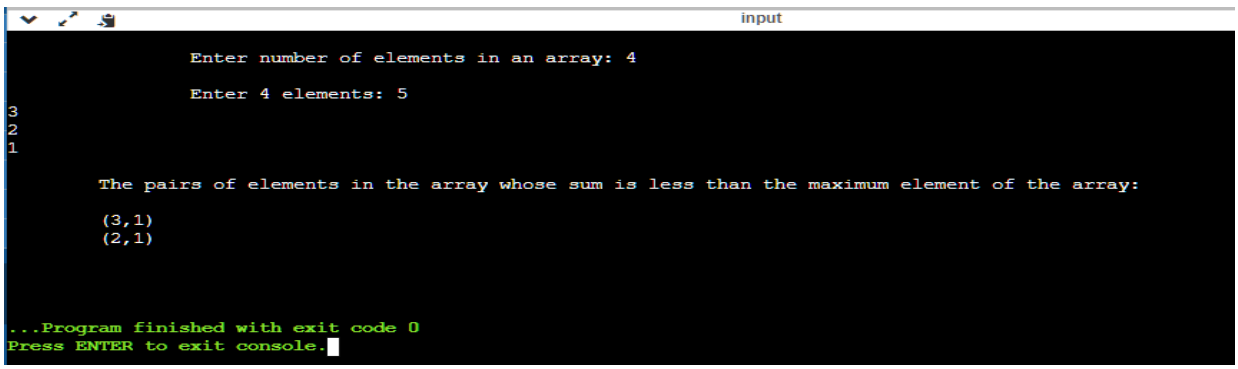
1. **समस्या विवरण:** एक प्रोग्राम लिखें जो एरे में ऐसे एलिमेंट्स की जोड़ी खोजे जिनका सम मैक्सिमम एलिमेंट से कम हो।

Problem Statement: Write a program to find the pair of elements in an array whose sum is less than maximum element.

Code:

```
#include <iostream>
using namespace std;

int main()
{
   int a[20], i, j, n, max;

   cout << "\n\t\tEnter number of elements in an array: ";
   cin >> n;
```

```
    cout << "\n\t\tEnter " << n << " elements: ";
    for (i = 0; i < n; i++)
        cin >> a[i];

    max = a[0];
    for (i = 0; i < n; i++)
    {
        if (a[i] > max)
        {
            max = a[i];
        }
    }

    cout << "\n\tThe pairs of elements in the array whose sum is less than the maximum element of the array: \n\n\t";
    for (i = 0; i < n; i++)
    {
        for (j = i + 1; j < n; j++)
        {
            if (a[i] + a[j] < max)
            {
                cout << "(" << a[i] << "," << a[j] << ")" << "\n\t";
            }
        }
    }

    cout << endl << endl;
    return 0;
}
```



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2. **समस्या विवरण:** एक प्रोग्राम लिखें जो नंबर्स की फ्रिक्वेंसी को खोजे।

Problem Statement: Write a program to find frequency of numbers.

Code:

```
#include <iostream>
using namespace std;

int main()
{
   const int MAX_SIZE = 25;
   int a[MAX_SIZE], b[MAX_SIZE], i, j, k, n, temp = 0, c = 0;

   cout << "\n\t\tEnter number of elements in an array (up to " << MAX_SIZE << "): ";
   cin >> n;

   if (n > MAX_SIZE || n <= 0) {
     cout << "Invalid input. Number of elements should be between 1 and " << MAX_SIZE <<
".\n";
       return 1;
   }

   cout << "\n\t\tEnter " << n << " elements: ";
   for (i = 0; i < n; i++)
      cin >> a[i];

   // Grouping similar elements together
   for (i = 0; i < n; i++)
   {
      for (j = i + 1; j < n; j++)
      {
         if (a[i] == a[j])
         {
            for (k = j; k > i + 1; k--)
            {
               temp = a[k];
               a[k] = a[k - 1];
               a[k - 1] = temp;
```

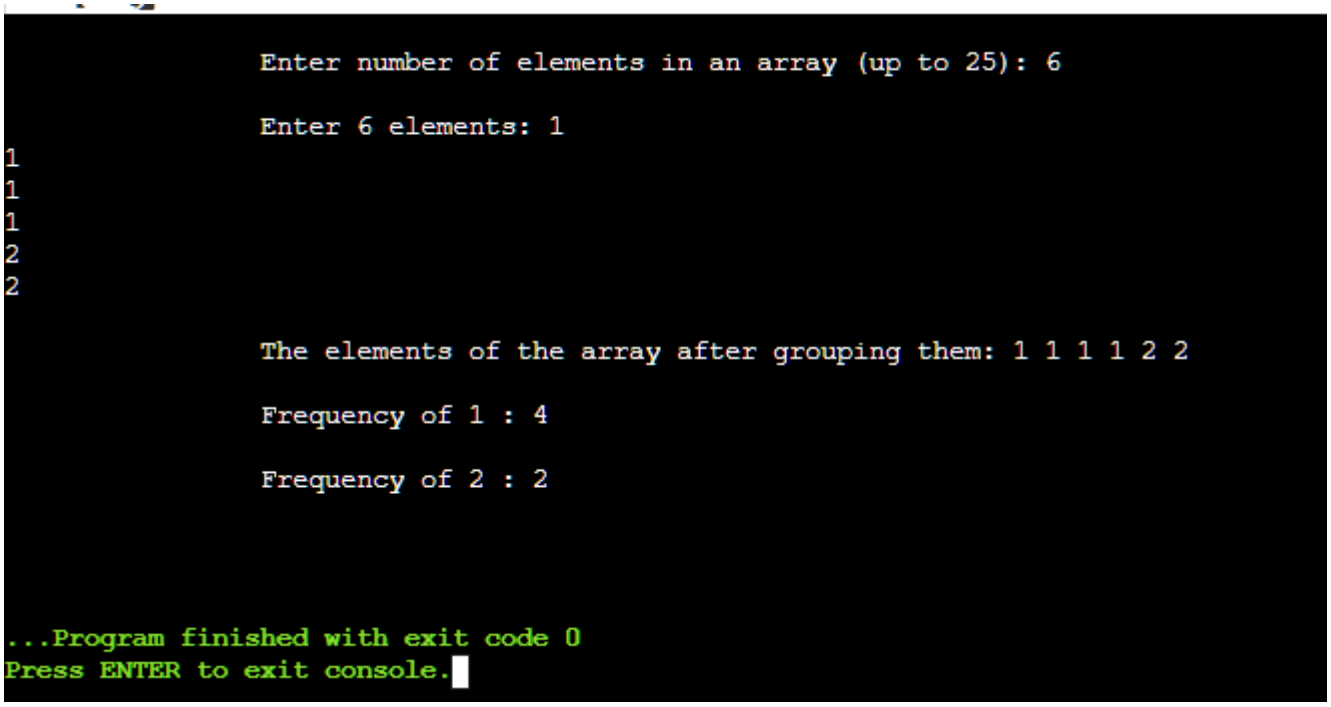
```
            }
        }
    }
}

cout << "\n\t\tThe elements of the array after grouping them: ";
for (i = 0; i < n; i++)
{
    cout << a[i] << " ";
}

// Calculating the frequency of each element in the array
for (i = 0; i < n; i++)
{
    c = 1;
    if (a[i] != -1)
    {
        for (j = i + 1; j < n; j++)
        {
            if (a[i] == a[j])
            {
                c++;
                a[j] = -1; // Mark the element as visited to avoid recounting
            }
        }
        b[i] = c;
    }
}

cout << endl;
for (i = 0; i < n; i++)
{
    if (a[i] != -1)
        cout << "\n\t\tFrequency of " << a[i] << " : " << b[i] << endl;
}

cout << "\n\n";
return 0;
}
```



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3. **समस्या विवरण:** एक प्रोग्राम लिखें जो मैट्रिक्स को अपर ट्राइएंगुलर मैट्रिक्स में ट्रांसफॉर्म करे।

Problem Statement: Write a program to the matrix transformed to upper triangular matrix.

Code:

```
#include <iostream>
#include <iomanip>
using namespace std;

int main()
{
   double a[3][3];

   cout << "\n\t\tEnter elements of 3x3 matrix:" << endl << endl;
   for (int i = 0; i < 3; i++)
   {
      for (int j = 0; j < 3; j++)
      {
```

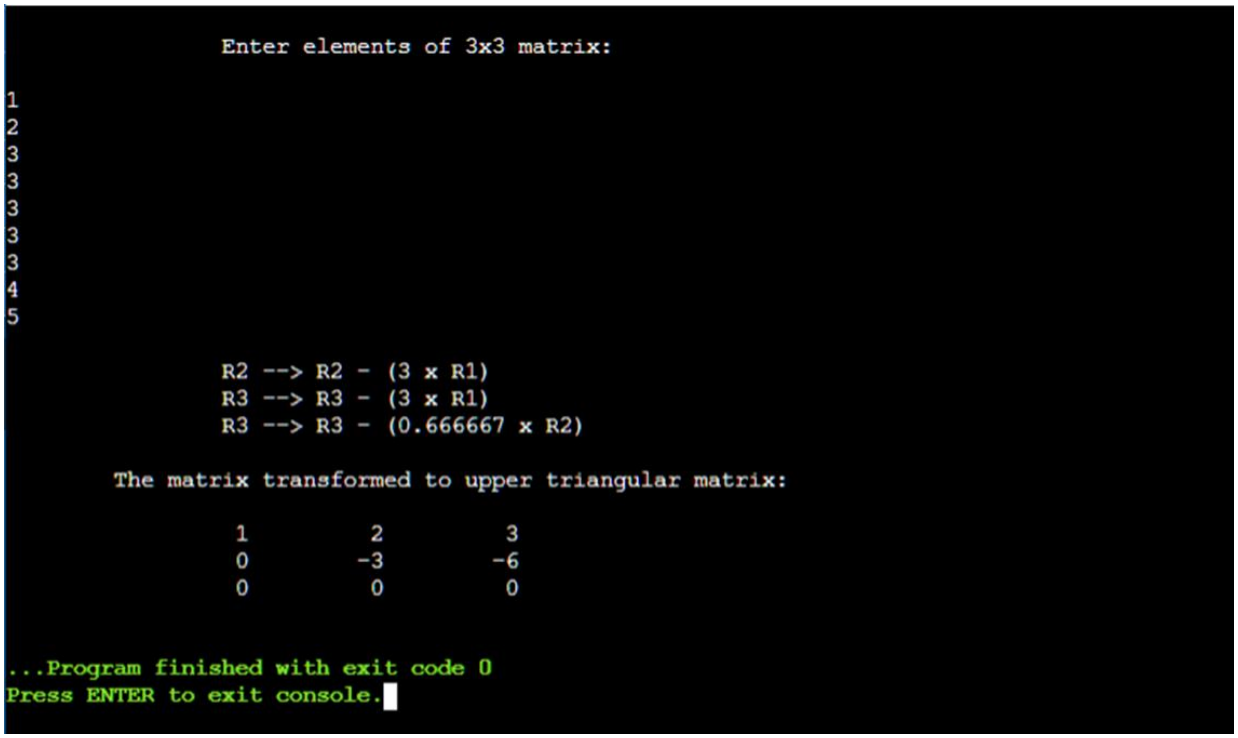
```
            cin >> a[i][j];
        }
    }

    double x = a[1][0] / a[0][0];
    cout << "\n\t\tR2 --> R2 - (" << x << " x R1)";
    for (int j = 0; j < 3; j++)
    {
        a[1][j] -= (x * a[0][j]);
    }

    x = a[2][0] / a[0][0];
    cout << "\n\t\tR3 --> R3 - (" << x << " x R1)";
    for (int j = 0; j < 3; j++)
    {
        a[2][j] -= (x * a[0][j]);
    }

    x = a[2][1] / a[1][1];
    cout << "\n\t\tR3 --> R3 - (" << x << " x R2)";
    for (int j = 0; j < 3; j++)
    {
        a[2][j] -= (x * a[1][j]);
    }
    cout << "\n\n\tThe matrix transformed to upper triangular matrix: " << endl << "\n\t";
    for (int i = 0; i < 3; i++)
    {
        for (int j = 0; j < 3; j++)
        {
            cout << right << setw(10) << a[i][j];
        }
        cout << "\n\t";
    }

    return 0;
}
```



Lab: 03

1. **समस्या विवरण:** किसी भी स्ट्रिंग में उपस्थित वॉवेल्स और कॉन्सोनेंट्स की संख्या गिनने वाला प्रोग्राम।

Problem Statement: Program to count number of vowels and consonants present in any string.

Code:

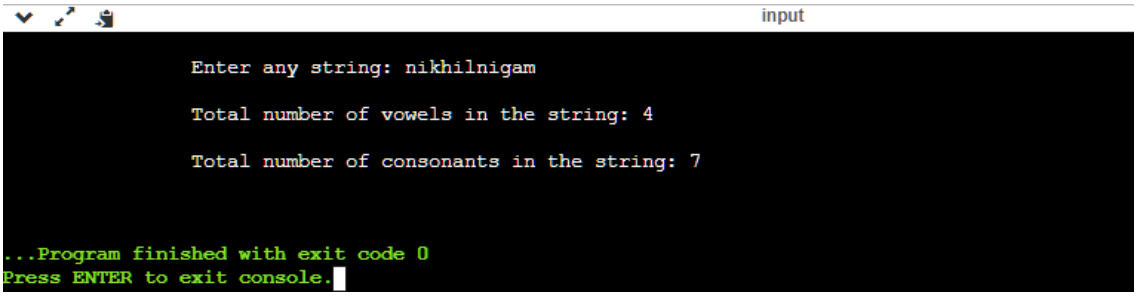
```
#include <iostream>
using namespace std;

int main()
{
   char str[25];
   char *ptr;
   int vcnt = 0, ccnt = 0;

   cout << "\n\t\tEnter any string: ";
   cin.getline(str, 25); // Use getline() to safely read the input string
```

```
    ptr = str;
    while (*ptr != '\0')
    {
        if (*ptr == 'a' || *ptr == 'e' || *ptr == 'i' || *ptr == 'o' || *ptr == 'u' ||
            *ptr == 'A' || *ptr == 'E' || *ptr == 'I' || *ptr == 'O' || *ptr == 'U')
        {
            vcnt++;
        }
        else if ((*ptr >= 'a' && *ptr <= 'z') || (*ptr >= 'A' && *ptr <= 'Z'))
        {
            ccnt++;
        }
        ptr++;
    }

    cout << "\n\t\tTotal number of vowels in the string: " << vcnt << endl;
    cout << "\n\t\tTotal number of consonants in the string: " << ccnt << endl << endl;
    return 0;
}
```



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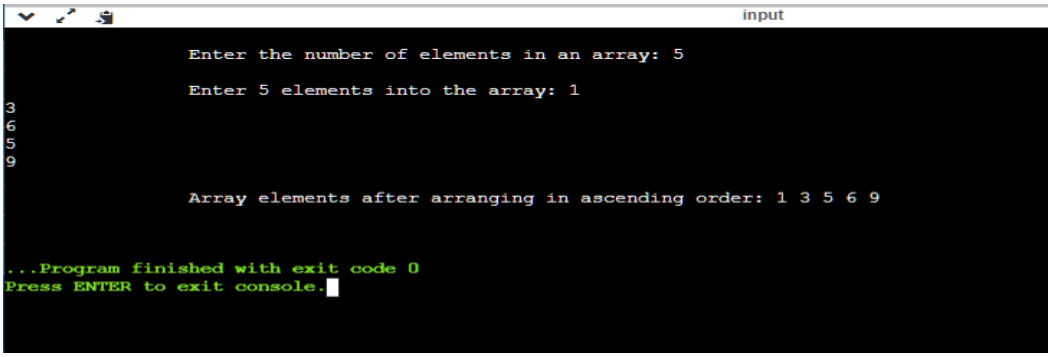
2. **समस्या विवरण:** पॉइंटर का उपयोग करके एरे एलिमेंट्स को सॉर्ट करने वाला प्रोग्राम।

Problem Statement: Program to nsort the array elements using pointer.

Code:

```
##include <iostream>
using namespace std;

int main()
{
```

```
    int a[25], n, i, j, temp;
    int *ptr;

    ptr = a;
    cout << "\n\t\tEnter the number of elements in an array: ";
    cin >> n;

    cout << "\n\t\tEnter " << n << " elements into the array: ";
    for (i = 0; i < n; i++)
    {
       cin >> *(ptr + i);
    }

    for (i = 0; i < n; i++)
    {
       for (j = i; j < n; j++)
       {
          if (*(ptr + i) > *(ptr + j))
          {
             temp = *(ptr + i);
             *(ptr + i) = *(ptr + j);
             *(ptr + j) = temp;
          }
       }
    }

    cout << "\n\t\tArray elements after arranging in ascending order: ";
    for (i = 0; i < n; i++)
    {
       cout << *(ptr + i) << " ";
    }

    cout << "\n\n";
    return 0;
}
```



Lab: 04

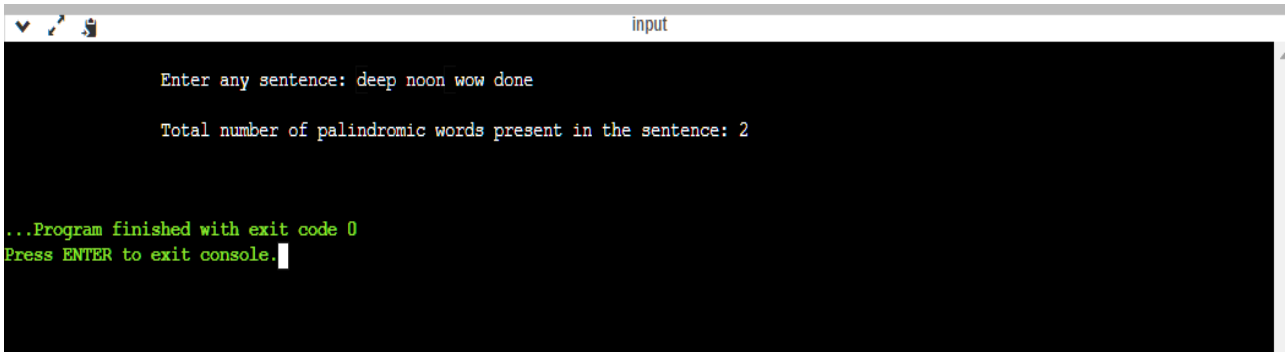
1. **समस्या विवरण:** यूज़र द्वारा दी गई किसी भी सेंटेन्स में उपस्थित पैलिनड्रोमिक शब्दों की संख्या पॉइंटर का उपयोग करके गिनने वाला प्रोग्राम।

Problem Statement: Program to count number of palindromic words present in any sentence given from the user using pointer.

Code:

```
#include <iostream>
#include <cstring>
#include <string>
using namespace std;

int checkPalin(string word)
{
   int n = word.length();
   for (int i = 0; i < n; i++)
   {
      if (word[i] >= 'A' && word[i] <= 'Z')
         word[i] += 32;
   }

   for (int i = 0; i < n; i++, n--)
   {
      if (word[i] != word[n - 1])
         return 0;
```

```
    }

    return 1;
}

int main()
{
    char s[50];
    char *p;
    p = s;
    int count = 0;
    string word = "";

    cout << "\n\t\tEnter any sentence: ";
    cin.getline(p, 50);

    strcat(p, " ");
    while (*p != '\0')
    {
        if (*p != ' ')
            word.push_back(*p);
        else
        {
            if (!word.empty())
            {
                if (checkPalin(word))
                    count++;
                word = "";
            }
        }
        p++;
    }

    cout << "\n\t\tTotal number of palindromic words present in the sentence: " << count << "\n\n";
    return 0;
}
```



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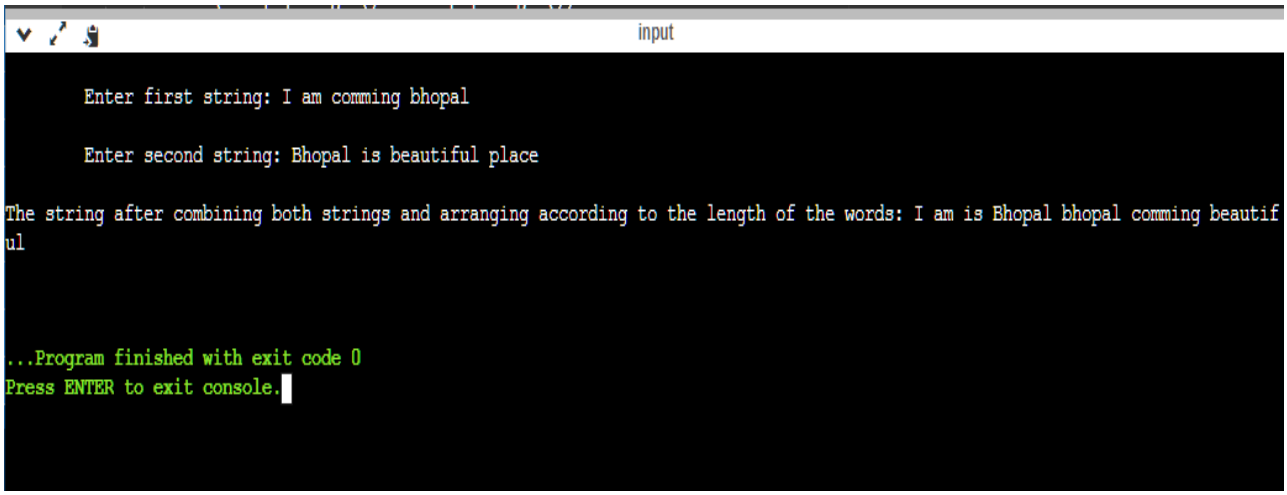
2. **समस्या विवरण:** दो स्ट्रिंग को इस प्रकार जोड़ने वाला प्रोग्राम कि कॉन्सकैटिनेटेड स्ट्रिंग के प्रत्येक शब्द को उसकी वर्ड लेंथ के अनुसार एसेंडिंग ऑर्डर में अरेंज किया जाए।

Problem Statement: Program to concatenate two strings such that each word of concatenated string should be arranged in ascending order by its word length.

Code:

```
#include <iostream>
#include <cstring>
#include <string>
using namespace std;

int main()
{
   char s1[50], s2[50], s[100];
   char *p;
   p = s;
   string word[20], temp, res = "";
   int i = 0, j, k;

   cout << "\n\tEnter first string: ";
   cin.getline(s1, 50);
   cout << "\n\tEnter second string: ";
   cin.getline(s2, 50);

   strcat(s1, " ");
   strcat(s1, s2);
```

```
    strcpy(p, s1);

    while (*p != '\0')
    {
        if (*p != ' ')
            word[i] += *p;
        else
            i++;
        p++;
    }

    j = i;
    for (i = 0; i < j; i++)
    {
        for (k = i + 1; k < j; k++)
        {
            if (word[i].length() > word[k].length())
            {
                temp = word[i];
                word[i] = word[k];
                word[k] = temp;
            }
        }
    }

    for (i = 0; i < j; i++)
    {
        res += word[i] + " ";
    }

    cout << "\nThe string after combining both strings and arranging according to the length of the
words: ";
    cout << res << "\n\n";

    return 0;
}
```



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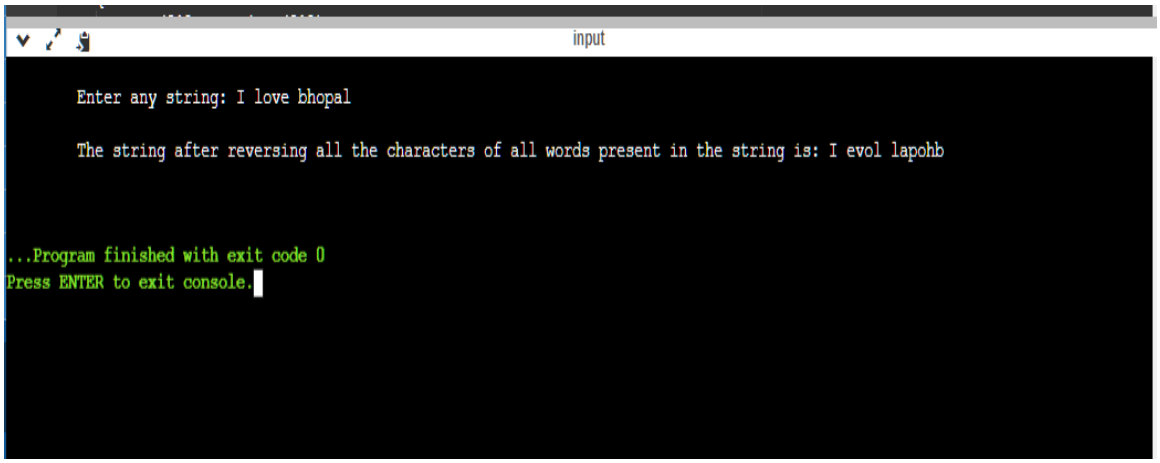
3. **समस्या विवरण:** स्ट्रिंग के प्रत्येक शब्द के अक्षरों को रिवर्स के लिए प्रोग्राम।

Problem Statement: program to reverse the characters in each word of a string.

Code:

```
#include <iostream>
#include <cstring>
#include <string>
using namespace std;

string rev(string word)
{
   int n = word.length();
   string rev_word;
   for (int i = 0; i < n; i++)
   {
      rev_word += word[n - i - 1];
   }
   return rev_word;
}

int main()
{
   char s[70];
```

```
    char *p;
    p = s;
    string word[20], temp, res = "";
    int i = 0, j;

    cout << "\n\tEnter any string: ";
    cin.getline(s, 70);

    strcat(p, " ");
    while (*p != '\0')
    {
       if (*p != ' ')
          word[i] += *p;
       else
          i++;
       p++;
    }

    j = i;
    for (i = 0; i < j; i++)
    {
       word[i] = rev(word[i]);
    }

    for (i = 0; i < j; i++)
    {
       res += word[i] + " ";
    }

    cout << "\n\tThe string after reversing all the characters of all words present in the string is: ";
    cout << res << "\n\n";

    return 0;
}
```



Lab: 05

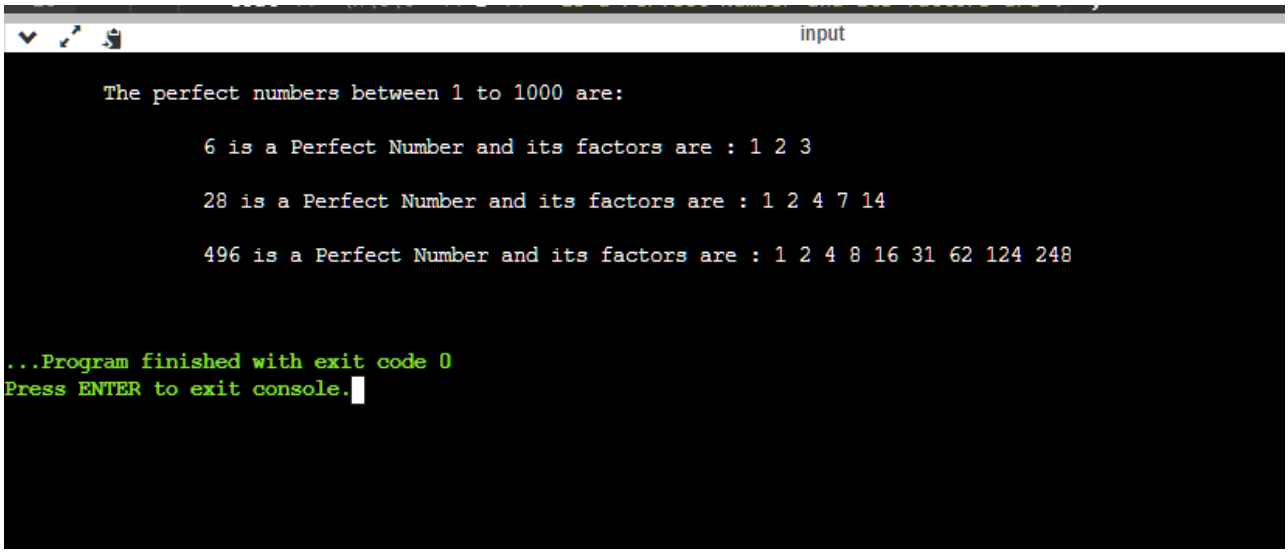
1. **समस्या विवरण:** फ़ंक्शन is_Perfect का उपयोग करके 1 से 1000 तक सभी पूर्णांकों को प्रिंट करने के लिए प्रोग्राम।

Problem Statement: Program to print all the perfect numbers between 1 to 1000 by using is_Perfect function.

Code

```
#include<iostream>
using namespace std;

void isPerfect()
{
   int i, j, k = 0, sum = 0, a[100];

   for (i = 1; i < 1000; i++)
   {
      sum = 0;
      k = 0;

      for (j = 1; j < i; j++)
      {
```

```
            if (i % j == 0)
            {
                a[k] = j;
                sum += a[k];
                k++;
            }
        }

        if (sum == i)
        {
            j = k;
            cout << "\n\t\t" << i << " is a Perfect Number and its factors are : ";
            for (k = 0; k < j; k++)
            {
                cout << a[k] << " ";
            }
            cout << "\n";
        }
    }
}

int main()
{
    cout << "\n\tThe perfect numbers between 1 to 1000 are: \n";
    isPerfect();
    cout << endl;
    return 0;
}
```



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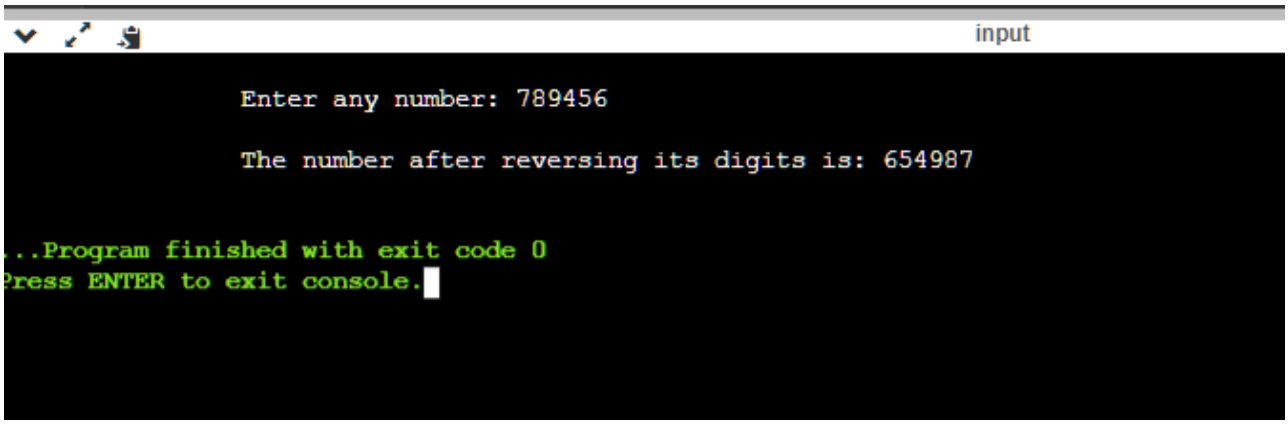
2. **समस्या विवरण:** फ़ंक्शन का उपयोग करके दिए गए नंबर के अंकों को उलटने और उन्हें प्रिंट करने के लिए प्रोग्राम।

Problem Statement: Program to reverse the digits of a given number by using function and print it.

Code

```
#include <iostream>
using namespace std;

int rev_numb(int n)
{
   int r, rev = 0;
   while (n > 0)
   {
      r = n % 10;
      rev = rev * 10 + r;
      n = n / 10;
   }
   return rev;
}
```

```
int main()
{
   int n, rev;

   cout << "\n\t\tEnter any number: ";
   cin >> n;

   rev = rev_numb(n);

   cout << "\n\t\tThe number after reversing its digits is: " << rev << endl;
   return 0;
}
```



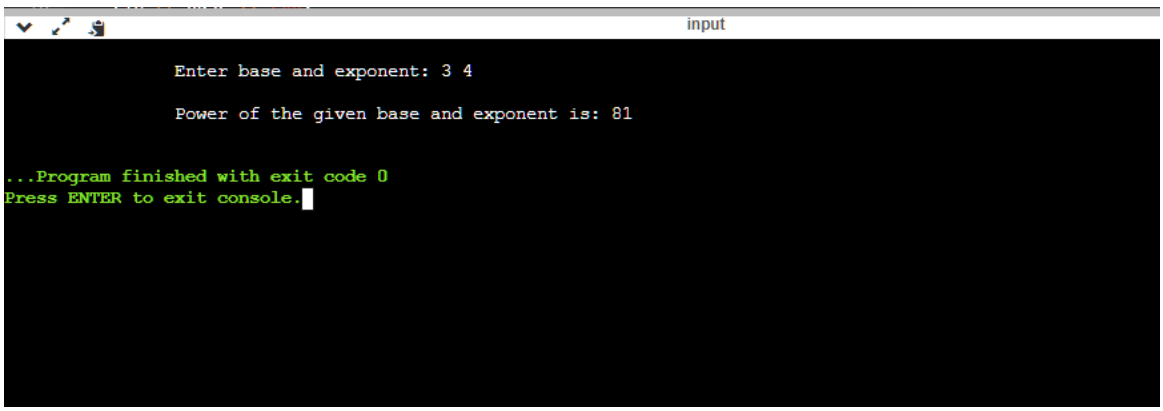
---

3. **समस्या विवरण:** फ़ंक्शन pow(base, exponent) का उपयोग करके दिए गए बेस और एक्सपोनेंट्स के पॉवर को खोजने के लिए प्रोग्राम।

Problem Statement: Program to find the power of the given base and exponent by using function pow(base, exponent).

Code

```
#include <iostream>
using namespace std;

int power(int base, int exp)
{
   int i, pow = 1;
   for (i = 0; i < exp; i++)
   {
      pow *= base;
   }
   return pow;
}

int main()
{
   int base, exp, pow;
   cout << "\n\t\tEnter base and exponent: ";
   cin >> base >> exp;
   pow = power(base, exp);
   cout << "\n\t\tPower of the given base and exponent is: " << pow << endl;
   return 0;
}
```



Lab: 06

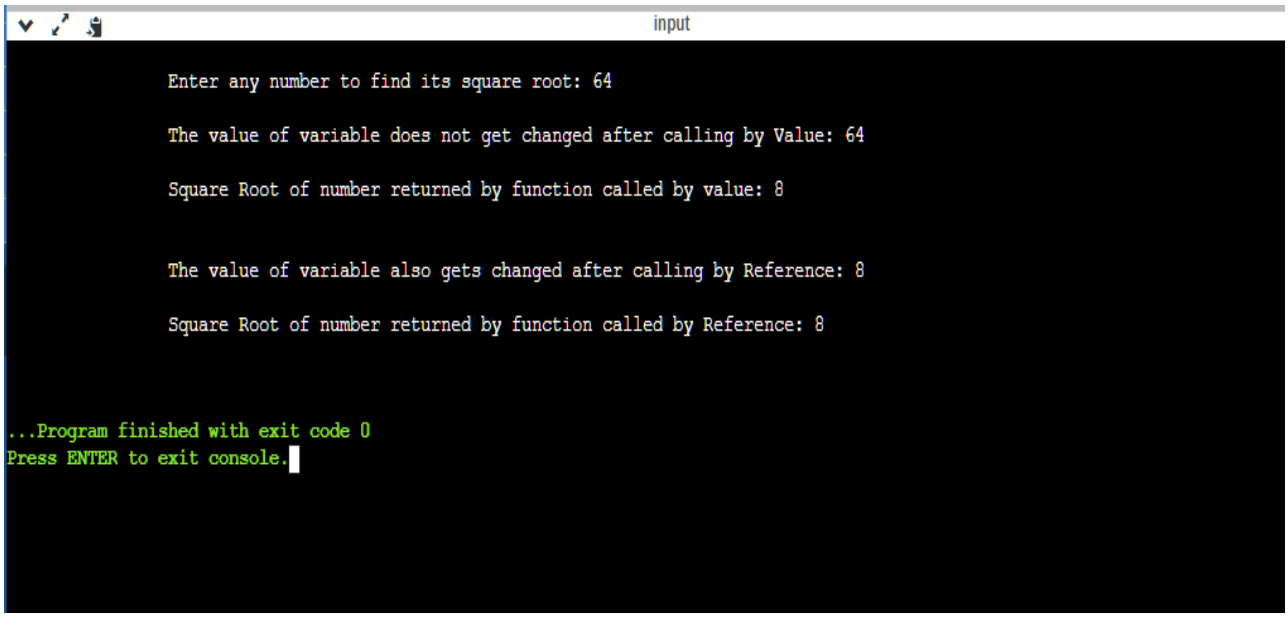
1. **समस्या विवरण:** किसी वेरिएबल का स्क्वेयर रूट फाइंड करने के लिए फंक्शन को बाय वैल्यू और बाय रेफरेंस कॉल करते हुए, रेफरेंस पैरामीटर का उपयोग करने वाला प्रोग्राम।

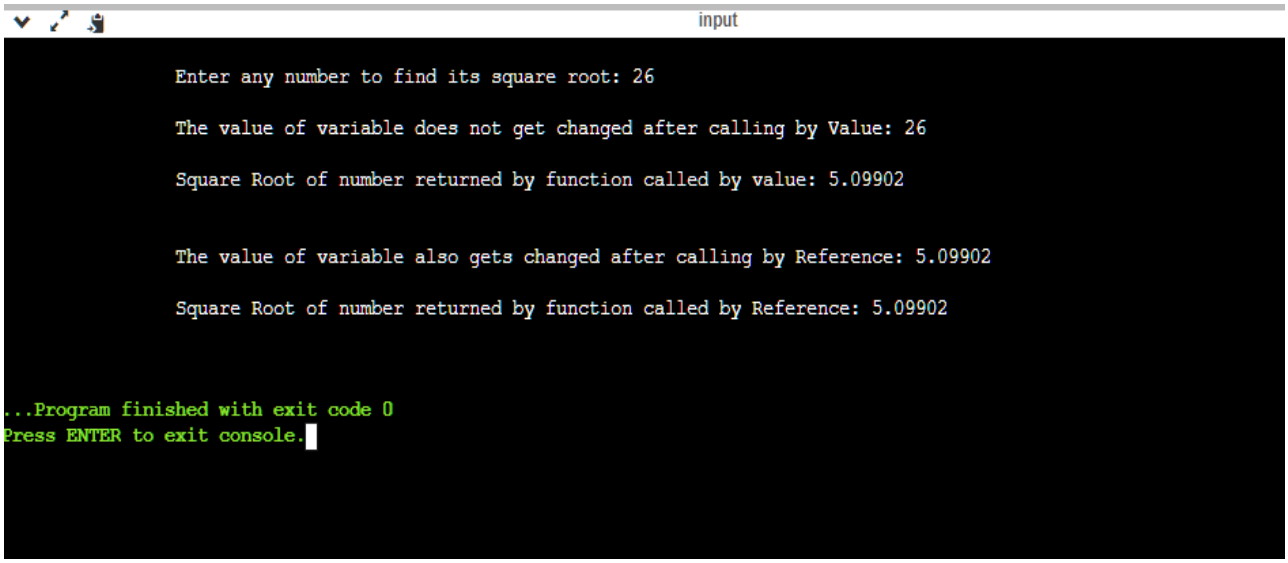
   Problem Statement: Finding Square root of a variable by calling function by value and by reference using reference parameter.

Code

```
#include <iostream>
#include <cmath>
using namespace std;
float SrootByValue(float n)
{
   n = sqrt(n);
   return n;
}
float SrootByReference(float &n)
{
   n = sqrt(n);
   return n;
}
int main()
{
   float val, sq;
   cout << "\n\t\tEnter any number to find its square root: ";
   cin >> val;
   sq = SrootByValue(val);
   cout << "\n\t\tThe value of variable does not get changed after calling by Value: " << val
<< "\n";
```

```
    cout << "\n\t\tSquare Root of number returned by function called by value: " << sq << "\n\n";

    sq = SrootByReference(val);

    cout << "\n\t\tThe value of variable also gets changed after calling by Reference: " << val << "\n";

    cout << "\n\t\tSquare Root of number returned by function called by Reference: " << sq << "\n\n";

    return 0;

}
```





---

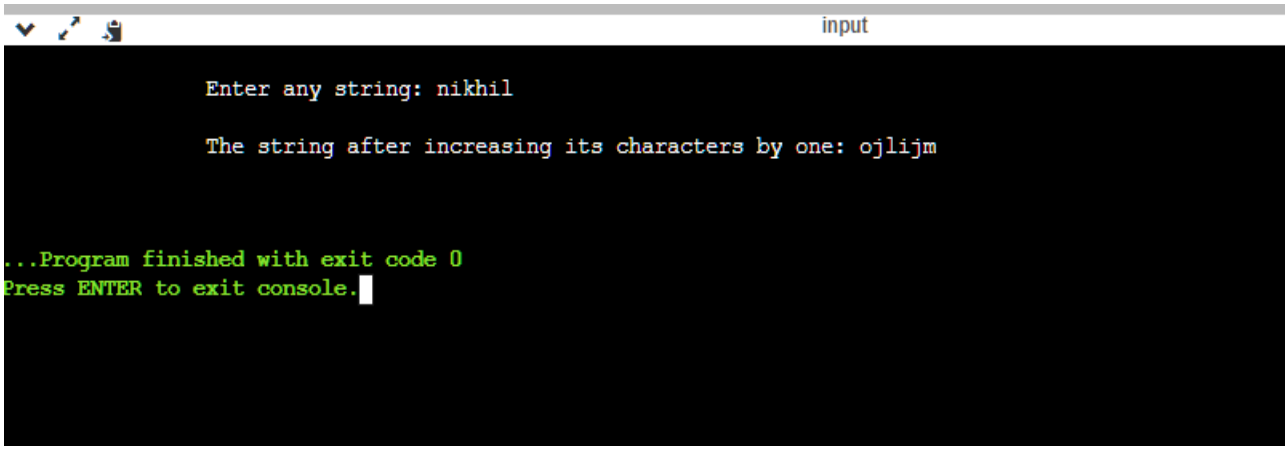
2. **समस्या विवरण:** दी गई स्ट्रिंग के कैरेक्टर्स को इनक्रीज़ करके और फंक्शन का उपयोग करके प्राप्त स्ट्रिंग को प्रिंट करने वाला प्रोग्राम।

   Problem Statement: Increasing the characters of the given string and printing the resultant string by using function.

Code

```
#include <iostream>
using namespace std;

char increment(char &a)
{
   a += 1;
   return a;
}

int main()
{
   char a[30];
   int i;

   cout << "\n\t\tEnter any string: ";
   cin >> a;

   for (i = 0; a[i] != '\0'; i++)
```

```
    {
       increment(a[i]);
    }

    cout << "\n\t\tThe string after increasing its characters by one: " << a << "\n\n";
    return 0;
}
```



---

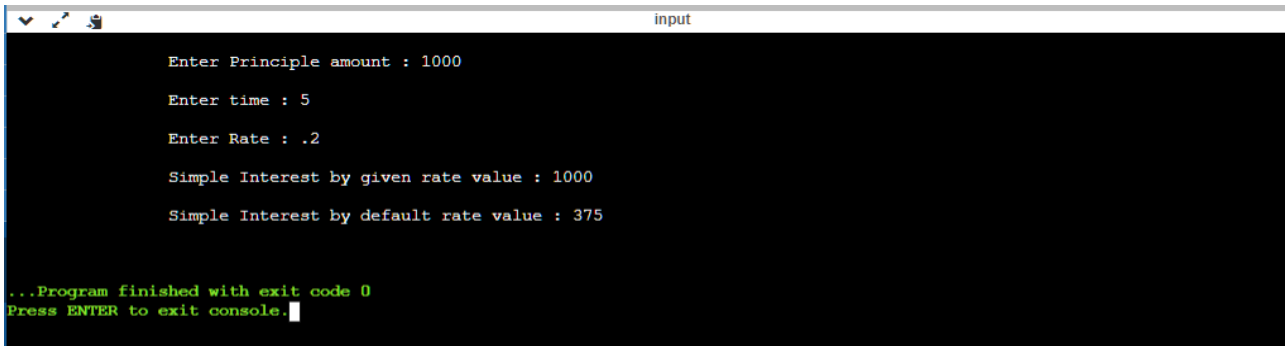
3. **समस्या विवरण:** प्रिंसिपल, रेट और टाइम वैल्यू को S_Interest फंक्शन में पास करके सिंपल इंटरेस्ट कैलकुलेट करने वाला प्रोग्राम, जिसमें r की वैल्यू डिफ़ॉल्ट रूप से 0.075 हो, और सिंपल इंटरेस्ट को डिफ़ॉल्ट वैल्यू और दी गई वैल्यू दोनों के साथ प्रिंट किया जाए।

   Problem Statement: Calculating simple interest by passing principle, rate, time values into a function S_Interest which contains an r values as default 0.075 and printing simple interest with default value and with given value.

   Code

```
#include<iostream>
using namespace std;
float S_Interest(int P,int T,float R=0.075)
{
float SI; SI=(P*T*R);
return SI;
}
int main()
{
int p,t;
```

```
float r,SI;
cout<<"\n\t\tEnter Principle amount : ";
 cin>>p;
cout<<"\n\t\tEnter time : ";
cin>>t;
cout<<"\n\t\tEnter Rate : ";
cin>>r; SI=S_Interest(p,t,r);
cout<<"\n\t\tSimple Interest by given rate value : "<<SI<<"\n";
 SI=S_Interest(p,t);
cout<<"\n\t\tSimple Interest by default rate value : "<<SI<<"\n\n";
return 0;
}
```



Lab: 07

1. **समस्या विवरण:** एक लिंक्ड लिस्ट में 10 एलिमेंट्स इंसर्ट करने वाला प्रोग्राम।

Problem Statement: Program to insert 10 elements in a linked list.

Code

```
#include<iostream> #include<conio.h> using namespace std;
 struct node
{
int data;
struct node *next;
};
struct node *list=NULL,*newnode,*temp; void insertion()
{
```

```
int p,i=1; for(p=0;p<10;p++)
{
if(p==0)
{
newnode=new struct node;
cout<<"\n\t\tEnter data of node you need to insert : "; cin>>newnode->data;
if(list==NULL) list=newnode;
else
{
newnode->next=list; list=newnode;
}
cout<<"\n\t\tThe node is inserted successfully at beginning of the linked list";
}
else
{
i=1;
newnode=new struct node; temp=list;
while(i<p)
{
temp=temp->next; i++;
}
cout<<"\n\n\t\tEnter data of node you need to insert : "; cin>>newnode->data;

newnode->next=temp->next; temp->next=newnode;
cout<<"\n\t\tThe node is inserted successfully at position "<<p+1;
if(p==9)
newnode->next=NULL;
}
}
getch();
}

void display()
{
struct node *temp; temp=list;
cout<<"\n\n\t\tThe elements in the linked list are : ";
while(temp!=NULL)
{
cout<<temp->data<<" "; temp=temp->next;
}
getch();
}
```

```
int main()
{
cout<<"\n\tInserting 10 elements into a linked list :-\n"; insertion();
system("cls");
cout<<"\n\tDisplaying elements in the linked list :-"; display();
cout<<"\n\n";
return 0;
}
```

input

```
Inserting 10 elements into a linked list :-

        Enter data of node you need to insert : 1

        The node is inserted successfully at beginning of the linked list

        Enter data of node you need to insert : 3

        The node is inserted successfully at position 2

        Enter data of node you need to insert : 3

        The node is inserted successfully at position 3

        Enter data of node you need to insert : 6

        The node is inserted successfully at position 4

        Enter data of node you need to insert : 6

        The node is inserted successfully at position 5

        Enter data of node you need to insert : 6

        The node is inserted successfully at position 6

        Enter data of node you need to insert : 6

        The node is inserted successfully at position 7

        Enter data of node you need to insert : 5

        The node is inserted successfully at position 8
```

```
                Enter data of node you need to insert : 9

                The node is inserted successfully at position 9

                Enter data of node you need to insert : 10

sh: 1: cls: not found
                The node is inserted successfully at position 10
        Displaying elements in the linked list :-

                The elements in the linked list are : 1 3 3 6 6 6 6 5 9 10


...Program finished with exit code 0
Press ENTER to exit console.
```

---

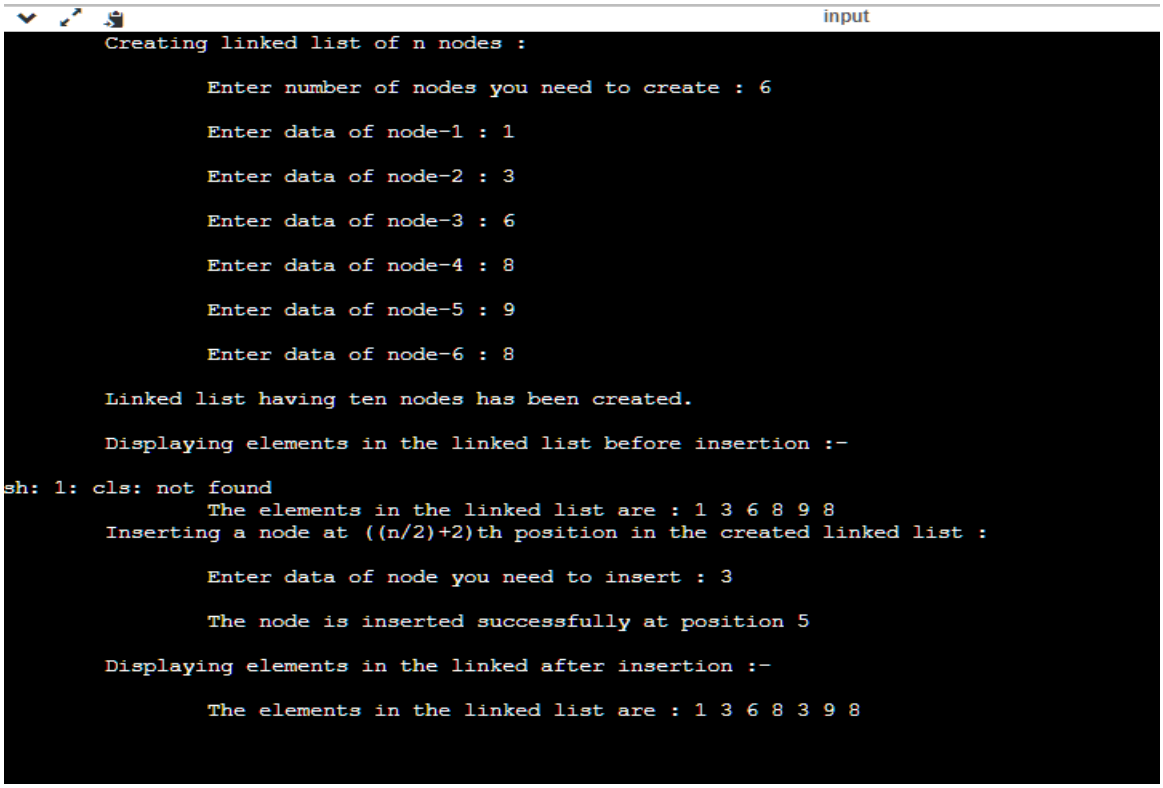
2. **समस्या विवरण:** एक लिंक्ड लिस्ट में 10 एलिमेंट्स इंसर्ट करने वाला प्रोग्राम।

Problem Statement: Program to insert 10 elements in a linked list.

Code

```
#include<iostream> #include<conio.h> using namespace std;
 struct node
{
int data;
struct node *next;
};
struct node *list=NULL,*newnode,*temp; void insertion()
{
int p,i=1; for(p=0;p<10;p++)
{
if(p==0)
{
newnode=new struct node;
cout<<"\n\t\tEnter data of node you need to insert : "; cin>>newnode->data;
if(list==NULL) list=newnode;
else
{
newnode->next=list; list=newnode;
}
```

```
cout<<"\n\t\tThe node is inserted successfully at beginning of the linked list";
}
else
{
i=1;
newnode=new struct node; temp=list;
while(i<p)
{
temp=temp->next; i++;
}
cout<<"\n\n\t\tEnter data of node you need to insert : "; cin>>newnode->data;

newnode->next=temp->next; temp->next=newnode;
cout<<"\n\t\tThe node is inserted successfully at position "<<p+1;
if(p==9)
newnode->next=NULL;
}
}
getch();
}

void display()
{
struct node *temp; temp=list;
cout<<"\n\n\t\tThe elements in the linked list are : ";
while(temp!=NULL)
{
cout<<temp->data<<" "; temp=temp->next;
}
getch();
}

int main()
{
cout<<"\n\tInserting 10 elements into a linked list :-\n"; insertion();
system("cls");
cout<<"\n\tDisplaying elements in the linked list :-"; display();
cout<<"\n\n";
return 0;
}
```



3. **समस्या विवरण:** मौजूदा लिंक लिस्ट से तीसरे अंतिम नोड को हटाने के लिए प्रोग्राम।

Problem Statement: Program to remove a node 3rd to last from an existing linked list.

Code

#include<iostream> #include<conio.h> using namespace std; struct node

{

int data;

struct node *next;

};

struct node *list=NULL,*newnode,*temp; int n;

void create()

{

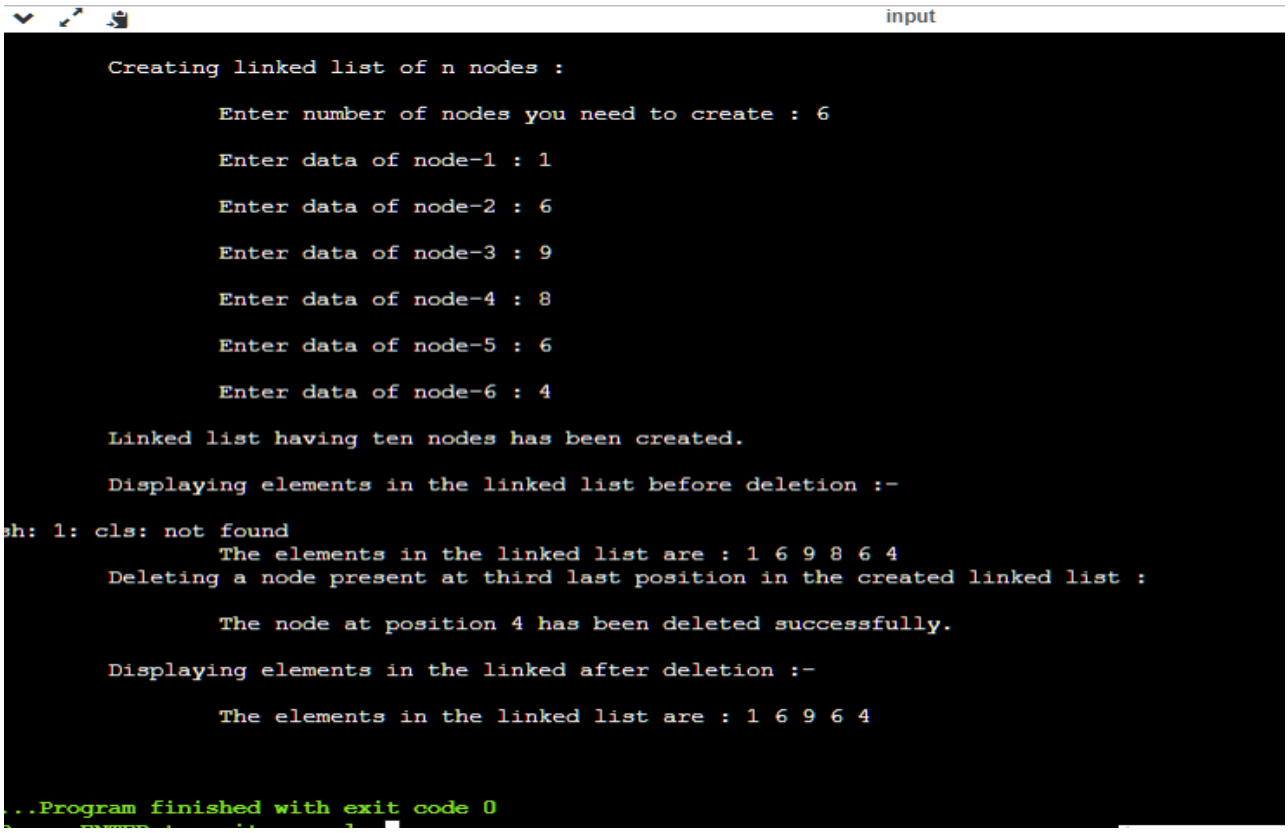
cout<<"\n\t\tEnter number of nodes you need to create : "; cin>>n;

for(int i=0;i<n;i++)

```
{
newnode=new struct node; cout<<"\n\t\tEnter data of node-"<<i+1<<" : "; cin>>newnode->data;
newnode->next=NULL; if(list==NULL) list=temp=newnode; else
{
temp->next=newnode; temp=newnode;
}
}
cout<<"\n\tLinked list having ten nodes has been created.";

getch();
}

void deletion()
{
struct node *nextnode; int p,i=1;
p=n-2;
if(p==1)
{
if(list==NULL)
cout<<"\n\t\tLinked list is Empty."; else
{
temp=list; list=list->next; free(temp);
cout<<"\n\t\tBeginning node has been deleted successfully.";
}
getch();
```

```
}
else{ temp=list; while(i<p-1)
{
temp=temp->next; i++;
}
newnode=temp->next;
temp->next=newnode->next; free(newnode);
cout<<"\n\t\tThe node at position "<<p<<" has been deleted successfully."; getch();
}
}

void display()
{
struct node *temp; temp=list;
cout<<"\n\n\t\tThe elements in the linked list are : ";
while(temp!=NULL)
{
cout<<temp->data<<" ";
temp=temp->next;
}
getch();
}

int main()
{
```

```
cout<<"\n\tCreating linked list of n nodes :"<<endl; create();

cout<<"\n\n\tDisplaying elements in the linked list before deletion :-";

display(); system("cls");

cout<<"\n\tDeleting a node present at third last position in the created linked list :"<<endl;

deletion();

cout<<"\n\n\tDisplaying elements in the linked after deletion :-"; display();

cout<<"\n\n"; return 0;

}
```



4. **समस्या विवरण:** एक लिंक लिस्ट में डुप्लिकेट नोड (जो हैं अगर हों) का पता लगाने के लिए प्रोग्राम।

Problem Statement: Program to detect duplicate node(s) if exists in a linked list.

Code

```
#include<iostream> #include<conio.h> using namespace std; struct node
{
int data;
struct node *next;
};
struct node *list=NULL,*newnode,*temp; int a[30];
void create()
{
int n,j=0;
cout<<"\n\t\tEnter number of nodes you need to create : "; cin>>n;
for(int i=0;i<n;i++)
{
newnode=new struct node; cout<<"\n\t\tEnter data of node-"<<i+1<<" : "; cin>>newnode->data;
newnode->next=NULL; if(list==NULL) list=temp=newnode; else
{
temp->next=newnode;


temp=newnode;
}
a[j]=-1; j++;
}
cout<<"\n\tLinked list having ten nodes has been created."; getch();
```

```
}
void finddupli()
{
struct node *t,*t1; t=list;
int c,i=0,j=0,d=0;
while(t!=NULL)
{
c=1;j=i+1; t1=t->next;
while(t1!=NULL)
{
if(t->data==t1->data)
{
c++; a[j]=0; d++;
}
j++;
t1=t1->next;
}
if(a[i]!=0)
{
a[i]=c;
}
i++;
t=t->next;
}
if(d!=0)
```

```
{

cout<<"\n\n\n\t\tDuplicate elements exits in the linked list."; cout<<"\n\n\n\tDuplicate elements in the linked list are : "<<endl; t=list;i=0;

while(t!=NULL)

{

if(a[i]!=0 && a[i]!=1)

{



cout<<"\n\t\t"<<t->data<<" occurring "<<a[i]<<" times";

}

i++;

t=t->next;

}

}

else

{

cout<<"\n\n\n\t\tDuplicate elements does not exist in the linked list.";

}

getch();

}

void display()

{

struct node *temp; temp=list;

cout<<"\n\n\t\tThe elements in the linked list are : "; while(temp!=NULL)

{

cout<<temp->data<<" "; temp=temp->next;
```

```
}
getch();
}

int main()
{
cout<<"\n\tCreating linked list :"<<endl; create();
system("cls");
cout<<"\n\n\tDisplaying elements in the linked list before deletion :-"; display();
finddupli();
cout<<"\n\n"; return 0;
}
```

```
input
        Creating linked list :
                Enter number of nodes you need to create : 6
                Enter data of node-1 : 1
                Enter data of node-2 : 6
                Enter data of node-3 : 3
                Enter data of node-4 : 5
                Enter data of node-5 : 1
                Enter data of node-6 : 3
sh: 1: cls: not found
        Linked list having ten nodes has been created.
        Displaying elements in the linked list before deletion :-
                The elements in the linked list are : 1 6 3 5 1 3

                Duplicate elements exits in the linked list.

        Duplicate elements in the linked list are :
                1 occurring 2 times
                3 occurring 2 times


...Program finished with exit code 0
Press ENTER to exit console.
```

If stack [i] matches with token input string pop the token else shift it repeat the process until it reaches to $.

Lab: 08

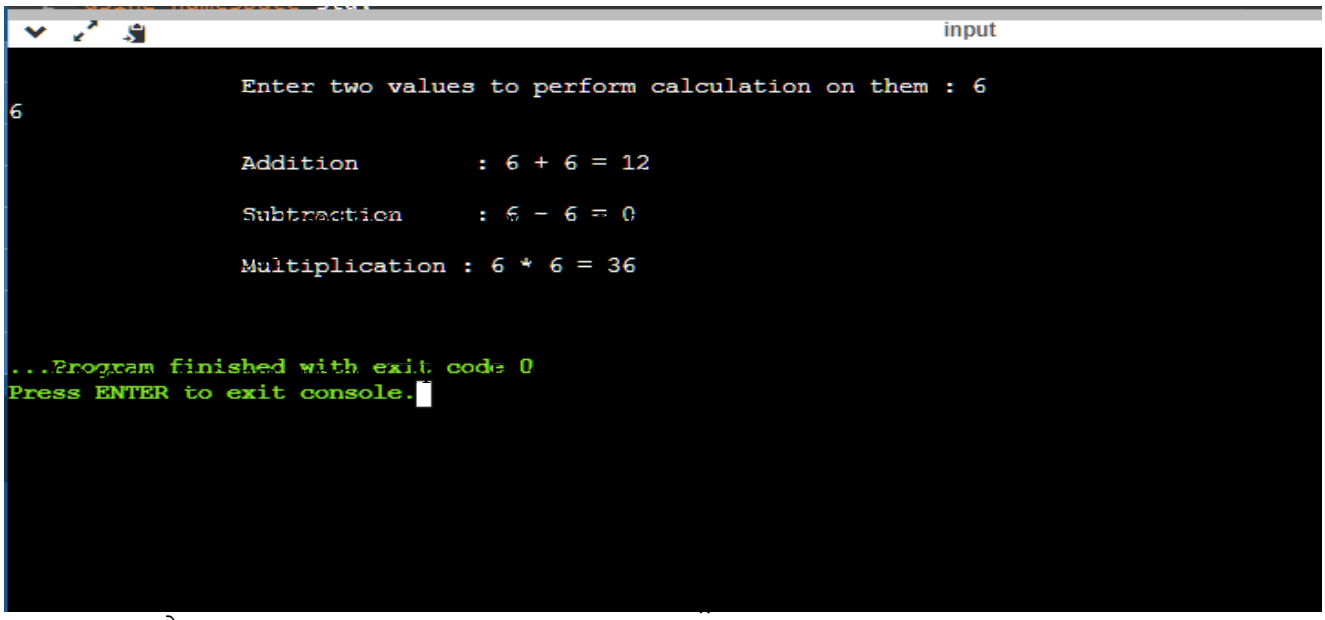
1. **समस्या विवरण:** एक क्लास कैलकुलेशन को परिभाषित करने के लिए एक प्रोग्राम लिखें, जिसमें थ्री मेम्बर फ़ंक्शन शामिल हों। वे हैं: जोड़, घटाव और दो मूल्यों का गुणा करें।

Problem Statement: Program to define a class named CALCULATION with three member functions in it such as add, sub and mul of two values.

Code

```
#include<iostream>
using namespace std;
class Calculation
{
int m,n; public :
int Add(int x,int y)
{
m=x; n=y;
return(m+n);
}
int Sub(int x,int y)
{
m=x; n=y;
return(m-n);
}
int Mul(int x,int y)
{
m=x; n=y;
return(m*n);
}
};
int main()
{
class Calculation add,sub,mul;
int a,b;
cout<<"\n\t\tEnter two values to perform calculation on them : ";
```

```
cin>>a>>b;
cout<<"\n\t\tAddition       :    "<<a<<"    +    "<<b<<"    =    "<<add.Add(a,b);
cout<<"\n\n\t\tSubtraction  :    "<<a<<"    -    "<<b<<"    =    "<<sub.Sub(a,b);
cout<<"\n\n\t\tMultiplication : "<<a<<" * "<<b<<" = "<<mul.Mul(a,b)<<"\n\n";
 return 0;
}
```



वाला प्रोग्राम।

Problem Statement: Program to arrange string in chronological order using class and object.

Code

```
#include<iostream>
#include<string>
#include<string.h>
using namespace std; class Order
{
private :
char s[20];
public :
void sort_string()
{
int n;
char temp;
n=strlen(s);
for(int i=0;i<n;i++)
{
```

```
for(int j=i+1;j<n;j++)
{
if(s[i]>s[j])
{
temp=s[i];
s[i]=s[j];
s[j]=temp;
}
}
}
}
void get_value()
{
cout<<"\n\t\tEnter any string : ";
gets(s);
}
void display()
{
cout<<"\n\t\tAfter arranging the string in chronological order : "<<s;
}
};
int main()
{
char st[20];
class Order str;
str.get_value();
str.sort_string();
str.display();
cout<<"\n\n";
return 0;
}
```

```
Enter any string : nikhil

After arranging the string in chronological order : hiikln


...Program finished with exit code 0
Press ENTER to exit console.
```

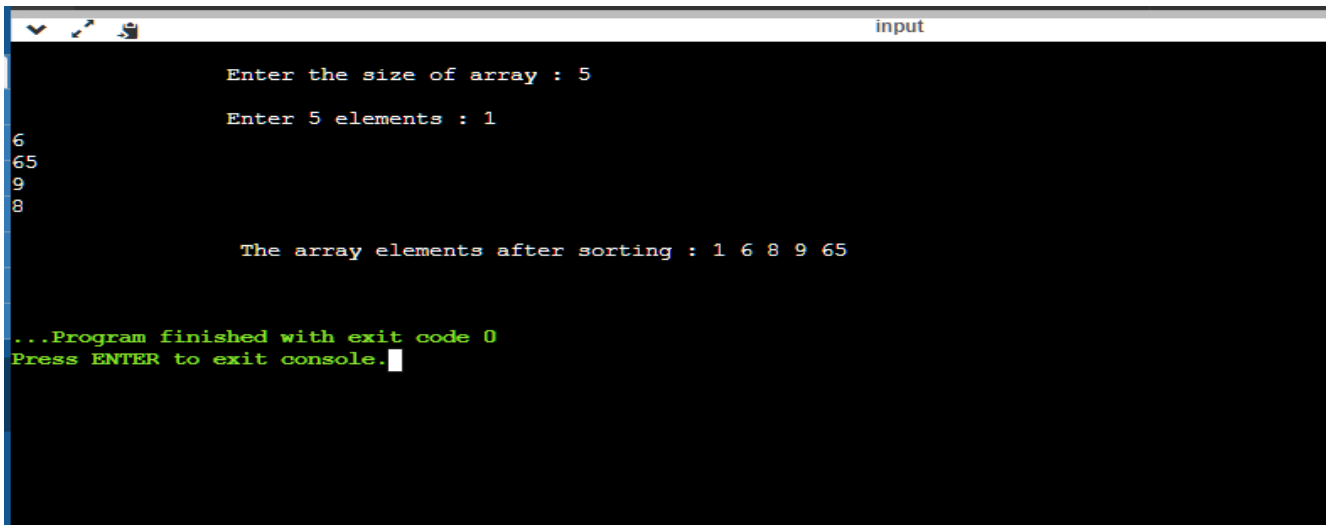
3. **समस्या विवरण:** मेम्बर फ़ंक्शन get_array और sort_array के साथ एक क्लास ऐरे को परिभाषित करने के लिए प्रोग्राम।

Problem Statement: Program to define a class ARRAY with member functions get_array and sort_array.

Code

```
#include<iostream>
using namespace std;
class Array
{
private :
int a[20],n;
public :
void sort_array()
{
int i,j,temp;
for(i=0;i<n;i++)
{
for(j=i+1;j<n;j++)
{
if(a[i]>a[j])
{
temp=a[i];
a[i]=a[j];
a[j]=temp;
}
}
}
}
void get_array()
{
cout<<"\n\t\tEnter the size of array : "; cin>>n;
cout<<"\n\t\tEnter "<<n<<" elements : "; for(int i=0;i<n;i++)
cin>>a[i];
}
void display()
{
cout<<"\n\t\t The array elements after sorting : "; for(int i=0;i<n;i++)
cout<<a[i]<<" ";
}
};
```

```
int main()
{
class Array arr;
arr.get_array();
arr.sort_array();
arr.display();
cout<<"\n\n";
return 0;
}
```



Lab: 09

1. **समस्या विवरण:** डिफ़ॉल्ट कंस्ट्रक्टर का उपयोग करके यह चेक करने वाला प्रोग्राम कि कोई नंबर ईवन है या ऑड।

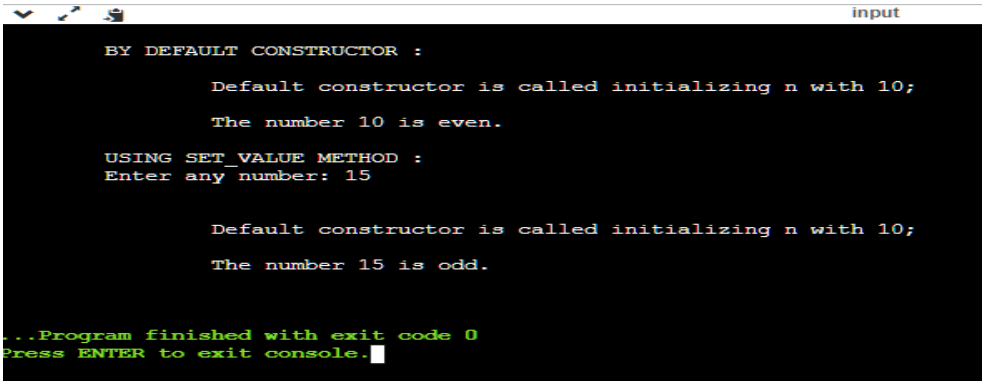
Problem Statement: Program to check whether a number is even or odd by using default constructor.

Code

```
#include <iostream>
using namespace std;
```

```
class EvenOddNum
{
private:
   int n;

public:
   EvenOddNum()
   {
      n = 10;
      cout << "\n\n\t\tDefault constructor is called initializing n with " << n << ";";
   }

   void set_value(int a)
   {
      n = a;
   }

   void find_num()
   {
      if (n % 2 == 0)
         cout << "\n\n\t\tThe number " << n << " is even.";
      else
         cout << "\n\n\t\tThe number " << n << " is odd.";
   }
};

int main()
{
   cout << "\n\tBY DEFAULT CONSTRUCTOR : ";
   EvenOddNum num;
   num.find_num();

   cout << "\n\n\tUSING SET_VALUE METHOD : ";
   int input;
   cout << "\n\tEnter any number: ";
   cin >> input;

   EvenOddNum num2;
   num2.set_value(input);
   num2.find_num();

   cout << "\n\n";
   return 0;
```

}



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2. **समस्या विवरण:** पैरामीटराइज़्ड कंस्ट्रक्टर का उपयोग करके एक नंबर के लिए प्राइम है या नहीं जांचने के लिए प्रोग्राम।

Problem Statement: Program to check whether a number is prime or not by using parameterized Constructor.

Code

```
#include <iostream>
using namespace std;

class Prime0rNot
{
private:
   int n;

public:
   Prime0rNot(int a)
   {
      n = a;
      cout << "\n\n\t\tParameterized Constructor is called. Number " << n << " is passed as an argument into it;";
```

```
    }

    void find_num()
    {
        int i;
        for (i = 2; i < n; i++)
        {
            if (n % i == 0)
                break;
        }
        if (i < n)
            cout << "\n\n\t\tThe number " << n << " is not Prime.";
        else
            cout << "\n\n\t\tThe number " << n << " is Prime.";
    }
};

int main()
{
    int n;
    cout << "\n\tBY PARAMETERIZED CONSTRUCTOR : ";
    cin >>n ;
    Prime0rNot num(n);
    num.find_num();
    cout << "\n\n";
    return 0;
}
```

```
BY PARAMETERIZED CONSTRUCTOR : 7


        Parameterized Constructor is called. Number 7 is passed as an argument into it;

        The number 7 is Prime.
```

---

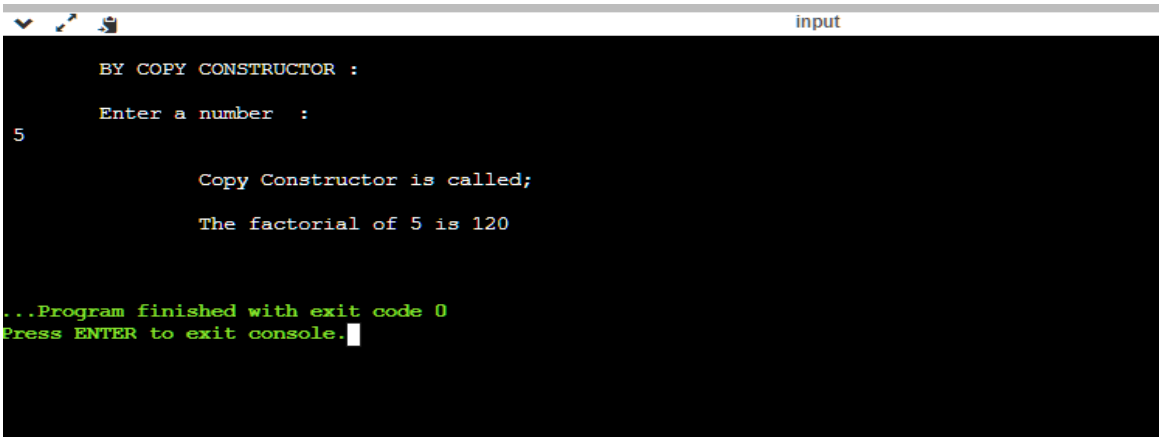
3. **समस्या विवरण:** कॉपी कंस्ट्रक्टर का उपयोग करके एक नंबर के फैक्टरियल की गणना करने के लिए प्रोग्राम।

Problem Statement: Program to calculate the factorial of the number by using copy constructor.

Code

```
#include <iostream>
using namespace std;

class factorial
{
private:
   int n;

public:
   factorial(int a)
   {
      n = a;
   }

   factorial(const factorial &f)
   {
      n = f.n;
      cout << "\n\t\tCopy Constructor is called;";
   }

   void fact()
   {
```

```
        int i, fac = 1;
        for (i = 1; i <= n; i++)
        {
           fac *= i;
        }
        cout << "\n\n\t\tThe factorial of " << n << " is " << fac;
    }
};

int main()
{
    int n;
    cout << "\n\tBY COPY CONSTRUCTOR :\n ";
    cout << "\n\tEnter a number  :\n ";
    cin >> n;
    factorial f1(n);
    factorial f2(f1);
    f2.fact();
    cout << "\n\n";
    return 0;
}
```



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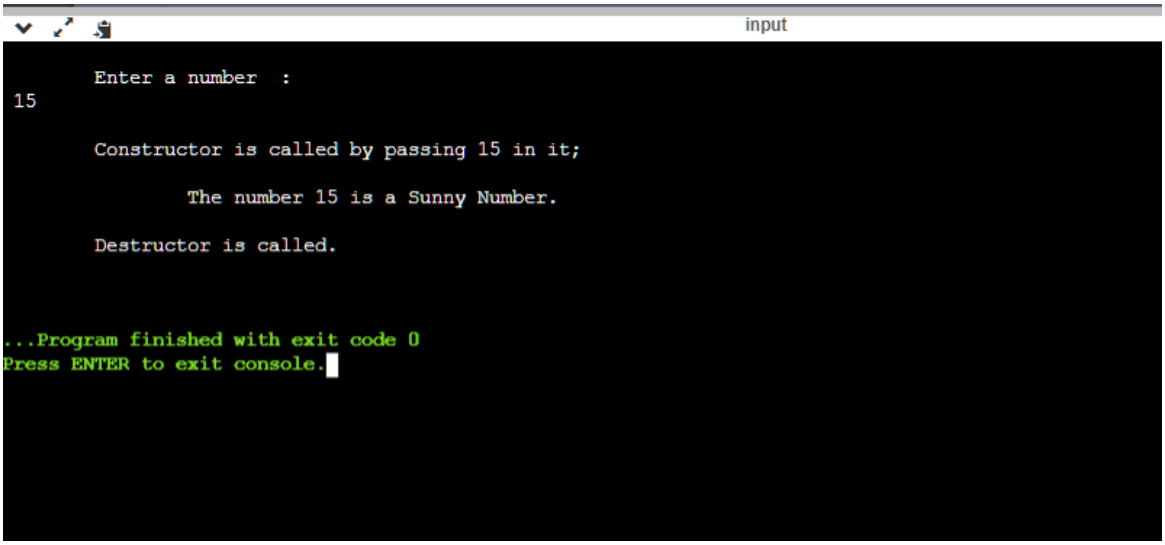
4. **समस्या विवरण:** कंस्ट्रक्टर और डीस्ट्रक्टर का उपयोग करके यह चेक करने वाला प्रोग्राम कि कोई नंबर सनी नंबर है या नहीं।

Problem Statement: Program to check whether a number is Sunny Number or not by using constructor and destructor.

Code

```
#include <iostream>
#include <cmath>
using namespace std;

class sunnyNumb
{
private:
   int n;

public:
   sunnyNumb(int a)
   {
      n = a;
      cout << "\n\tConstructor is called by passing " << n << " in it;";
   }

   void set_value(int a)
   {
      n = a;
   }

   void sunny_or_not()
   {
      double root = sqrt(n + 1);
      if ((int)root == root)
         cout << "\n\n\t\tThe number " << n << " is a Sunny Number.";
      else
         cout << "\n\n\t\tThe number " << n << " is not a Sunny Number.";
   }

   ~sunnyNumb()
   {
      cout << "\n\n\tDestructor is called.\n\n";
   }
};

int main()
{
   int n;
   cout << "\n\tEnter a number  :\n ";
   cin >> n;
   sunnyNumb num(n);
```

```
    num.sunny_or_not();
    return 0;
}
```



Lab: 10

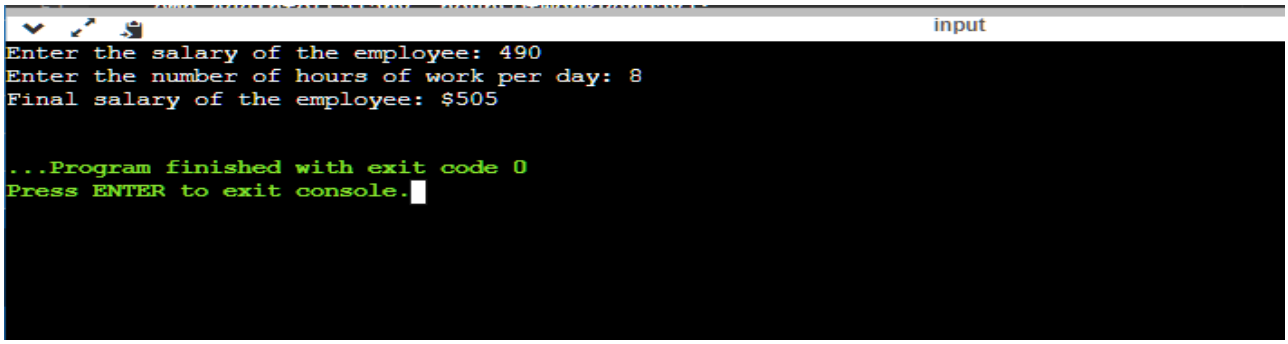
1. **समस्या विवरण:** C++ में एक 'Employee' क्लास बनाकर, जिसमें निम्नलिखित फंक्शन्स हों, एक प्रोग्राम लिखें और फाइनल सैलरी को प्रिंट करें।
    - 'AddInfo()' जो एम्प्लॉयी की सैलरी और प्रतिदिन के वर्क ऑवर्स को पैरामीटर्स के रूप में लेता है।
    - 'AddSal()' जो एम्प्लॉयी की सैलरी में $10 ऐड करता है अगर वह $500 से कम हो।
    - 'AddWork()' जो एम्प्लॉयी की सैलरी में $5 ऐड करता है अगर प्रतिदिन वर्क ऑवर्स 6 से अधिक हों।

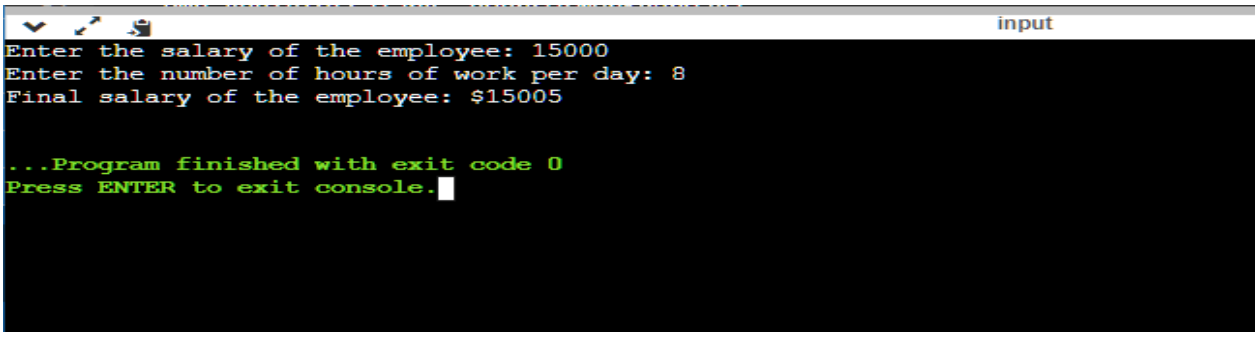
Code

```
#include <iostream>

using namespace std;

class Employee

{

private:
```

```
    double salary;
    int hoursOfWorkPerDay;
public:
    void AddInfo(double empSalary, empHoursOfWorkPerDay)
    {
        salary = empSalary;
        hoursOfWorkPerDay = empHoursOfWorkPerDay;
    }
    void AddSal()
    {
        if (salary < 500)
        {
            salary += 10;
        }
    }
    void AddWork()
    {
        if (hoursOfWorkPerDay > 6)
        {
            salary += 5;
        }
    }
    double GetFinalSalary()
    {
        return salary;
    }
```

```
};
int main()
{
   double salary;
   int hoursOfWorkPerDay;
   Employee emp;
   cout << "Enter the salary of the employee: ";
   cin >> salary;
   cout << "Enter the number of hours of work per day: ";
   cin >> hoursOfWorkPerDay;
   emp.AddInfo(salary, hoursOfWorkPerDay);
   emp.AddSal();
   emp.AddWork();

   double finalSalary = emp.GetFinalSalary();
   cout << "Final salary of the employee: $" << finalSalary <<
endl;
   return 0;
}
```





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2. **समस्या विवरण:** एक C++ प्रोग्राम लिखें जो निम्नलिखित क्लास हायरेरकी को इंप्लीमेंट करे:
   - ➤ Student: id, name
   - ➤ एग्ज़ाम (Student से व्युत्पन्न): 5 सब्जेक्ट्स के मार्क्स
   - ➤ रिज़ल्ट (Exam से व्युत्पन्न): परसेंटेज

• रिज़ल्ट क्लास के 'n' ऑब्जेक्ट्स बनाएं और मार्क्स लिस्ट डिस्प्ले करें।
• विवरण को एक्सेप्ट और डिस्प्ले करने के लिए उपयुक्त फंक्शन्स डिफ़ाइन करें।

Problem Statement: Write a C++ program to implement the following class hierarchy:
- ➢ Student: id, name
- ➢ Exam (derived from Student): Marks of 5 subjects
- ➢ Result (derived from Exam): Percentage.

- Create 'n' objects of the Result class and display the mark list.
- Define appropriate functions to accept and display details.

Code

```
#include <iostream>
#include <string>
using namespace std;

class Student {
protected:
   int id;
   string name;

public:
   void acceptDetails() {
      cout << "Enter ID: ";
```

```
        cin >> id;
        cin.ignore();
        cout << "Enter Name: ";
        getline(cin, name);
    }

    void displayDetails() const {
        cout << "ID: " << id << "\nName: " << name << endl;
    }
};

class Exam : public Student {
protected:
    int marks[5];

public:
    void acceptDetails() {
        Student::acceptDetails();
        cout << "Enter Marks for 5 subjects:" << endl;
        for (int i = 0; i < 5; i++) {
            cout << "Subject " << i + 1 << ": ";
            cin >> marks[i];
        }
    }

    void displayDetails() const {
        Student::displayDetails();
        cout << "Marks for 5 subjects:" << endl;
        for (int i = 0; i < 5; i++) {
            cout << "Subject " << i + 1 << ": " << marks[i] << endl;
        }
    }
};

class Result : public Exam {
public:
    float calculatePercentage() const {
        int totalMarks = 0;
        for (int i = 0; i < 5; i++) {
            totalMarks += marks[i];
        }
        return static_cast<float>(totalMarks) / 5;
    }
```

```
};

int main() {
    int n;
    cout << "Enter the number of students: ";
    cin >> n;

    Result* students[n];

    for (int i = 0; i < n; i++) {
        students[i] = new Result;
        cout << "\nEnter details for student " << i + 1 << ":" << endl;
        students[i]->acceptDetails();
    }

    cout << "\nMark List for " << n << " students:" << endl;
    for (int i = 0; i < n; i++) {
        cout << "\nStudent " << i + 1 << " Details:" << endl;
        students[i]->displayDetails();
        cout << "Percentage: " << students[i]->calculatePercentage() << "%" << endl;
    }

    for (int i = 0; i < n; i++) {
        delete students[i];
    }

    return 0;
```

```
Enter the number of students: 2

Enter details for student 1:
Enter ID: 12
Enter Name: Sachin
Enter Marks for 5 subjects:
Subject 1: 12
Subject 2: 23
Subject 3: 20
Subject 4: 25
Subject 5: 30

Enter details for student 2:
Enter ID: 13
Enter Name: Ashish
Enter Marks for 5 subjects:
Subject 1: 26
Subject 2: 23
Subject 3: 20
Subject 4: 21
Subject 5: 12

Mark List for 2 students:

Student 1 Details:
ID: 12
Name: Sachin
Marks for 5 subjects:
Subject 1: 12
Subject 2: 23
Subject 3: 20
Subject 4: 25
Subject 5: 30
Percentage: 22%

Student 2 Details:
ID: 13
Name: Ashish
Marks for 5 subjects:
Subject 1: 26
Subject 2: 23
Subject 3: 20
Subject 4: 21
Subject 5: 12
Percentage: 20.4%
```

3. **समस्या विवरण:** वर्चुअल बेस क्लास का उपयोग करके किसी नंबर का रिवर्स डिस्प्ले करने के लिए एक C++ प्रोग्राम लिखें।

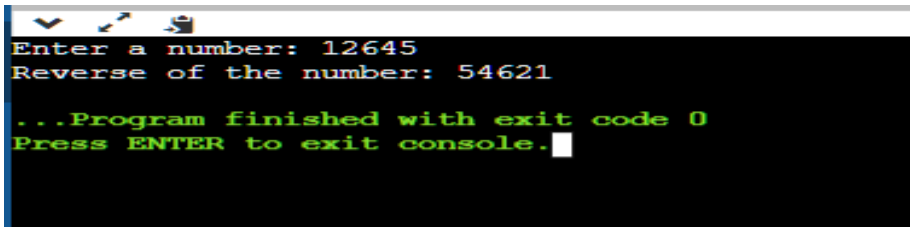
Problem Statement: Write a C++ Program to display the reverse of a number using the Virtual base Class.

Code:

```
#include <iostream>
#include <string>
#include <algorithm>
using namespace std;

class Base {
public:
   virtual void getNumber() = 0;
   virtual void reverse() = 0;
};
class Derived : public Base {
private:
   int number;
public:
   void getNumber() {
      cout << "Enter a number: ";
      cin >> number;
   }
   void reverse() {
      int reversed = 0;
      int temp = number;

      while (temp != 0) {
         reversed = reversed * 10 + temp % 10;
         temp /= 10;
      }
      cout << "Reverse of the number: " << reversed;
   }
};
int main() {
   Base* numObj;
   Derived intObj;
   numObj = &intObj;
   numObj->getNumber();
   numObj->reverse();
   return 0;
}
```



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4. **समस्या विवरण:** ऑपरेटर ओवरलोडिंग का उपयोग करके निम्नलिखित एक्सप्रेशन के मूल्य की गणना करने के लिए एक C++ प्रोग्राम लिखें: Obj1 = obj1 + obj2 * obj3 - obj4.

Problem Statement: Write a C++ program to calculate the value of the following expression using operator overloading. Obj1= obj1 + obj2 * obj3 – obj4.

Code:

```
#include <iostream>
using namespace std;
class MyObject
{
private:
   int value;
public:
   MyObject() : value(0) {}
   MyObject(int val) : value(val) {}

   MyObject operator+(const MyObject& other)
 {
      return MyObject(this->value + other.value);
   }

   MyObject operator*(const MyObject& other)
{
      return MyObject(this->value * other.value);
   }

   MyObject operator-(const MyObject& other) {
      return MyObject(this->value - other.value);
   }

   void display() {
      cout << "Result is: " << value;
```

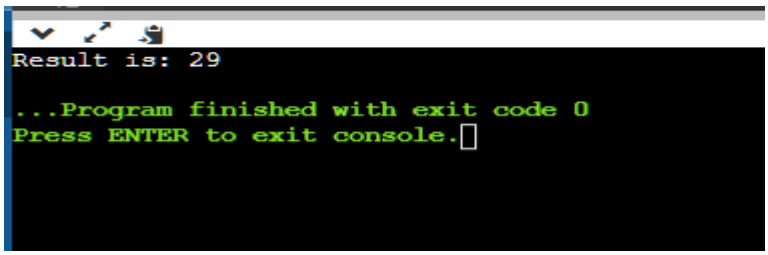
```
    }
};

int main() {
    MyObject obj1(7);
    MyObject obj2(3);
    MyObject obj3(8);
    MyObject obj4(2);

    MyObject result = obj1 + obj2 * obj3 - obj4;

    result.display();

    return 0;
}
```



Lab: 11

1. **समस्या विवरण:** पॉलीमॉर्फिज़म पर आधारित एक प्रोग्राम लिखें।
    - कंपाइल टाइम पॉलीमॉर्फिज़म
    - रनटाइम पॉलीमॉर्फिज़म

Problem Statement: Write a program based on Polymorphism:

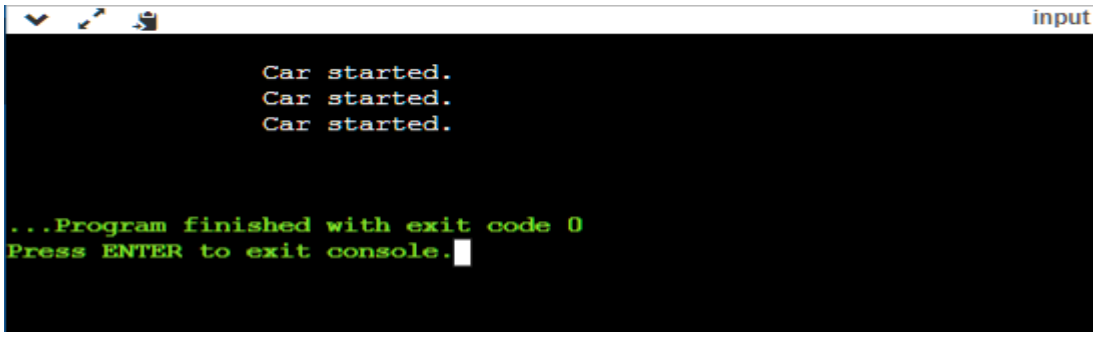
- Compile-time Polymorphism
- Run-time Polymorphism

1.1 कंपाइल टाइम पॉलीमॉर्फिज़म/ Compile-time Polymorphism

Code:

```
#include<iostream> using namespace std; class Car
{
public :
void start()
{
cout<<"\n\t\tCar started.";
}
};
class RangeRover : public Car
{
public :
void start()
{
cout<<"\n\t\tRange Rover started.";
}
};
class Swift : public Car
{
public :
void start()
{
cout<<"\n\t\tSwift started.";
}
};
int main()
{
Car c; RangeRover r; Swift s;
Car *ptr[3]; ptr[0]=&c; ptr[1]=&r;

ptr[2]=&s;
for(int i=0;i<3;i++)
{
ptr[i]->start();
}
cout<<"\n\n"; return 0;
}
```

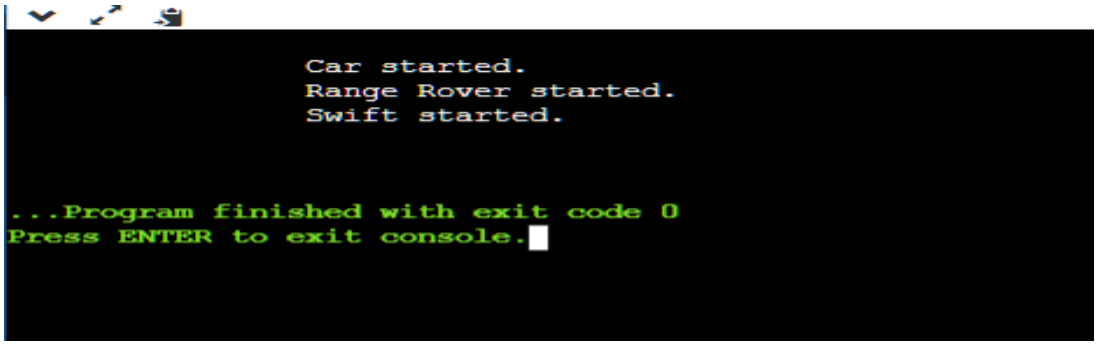


1.1 रनटाइम पॉलीमॉर्फिज़म / Run-time Polymorphism.

Code

```
#include<iostream> using namespace std; class Car
{
public :
virtual void start()
{
cout<<"\n\t\tCar started.";
}
};
class RangeRover : public Car
{
public :
void start()
{
cout<<"\n\t\tRange Rover started.";
}
};
class Swift : public Car
{
public :
void start()
{
cout<<"\n\t\tSwift started.";
}
};
int main()
{
Car c; RangeRover r; Swift s;
Car *ptr[3]; ptr[0]=&c; ptr[1]=&r; ptr[2]=&s;
for(int i=0;i<3;i++)
```

```
{
ptr[i]->start();
}
cout<<"\n\n"; return 0;
}
```



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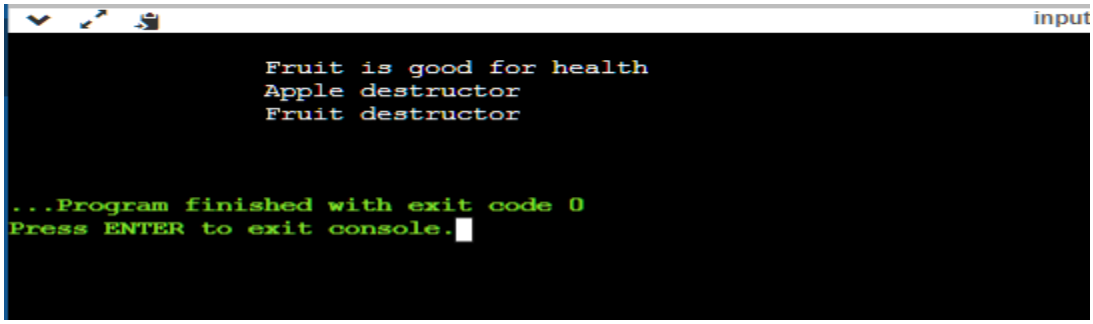
2. **समस्या विवरण:** वर्चुअल डिस्ट्रक्टर का उपयोग करके एक प्रोग्राम लिखें।

Problem Statement: Write a program by using Virtual Destructor.

Code:

```
#include<iostream> using namespace std; class Fruit
{
public :
void display()
{
cout<<"\n\t\tFruit is good for health";
}
virtual ~Fruit()
{
cout<<"\n\t\tFruit destructor";
}
};
class Apple : public Fruit
{
public :
void display()
{
cout<<"\n\t\tApple is good for health";
}
~Apple()
{
```

```
cout<<"\n\t\tApple destructor";
}
};
int main()
{
Fruit *ptr = new Apple; ptr->display();
delete ptr;
cout<<"\n\n"; return 0;
}
```



Lab: 12

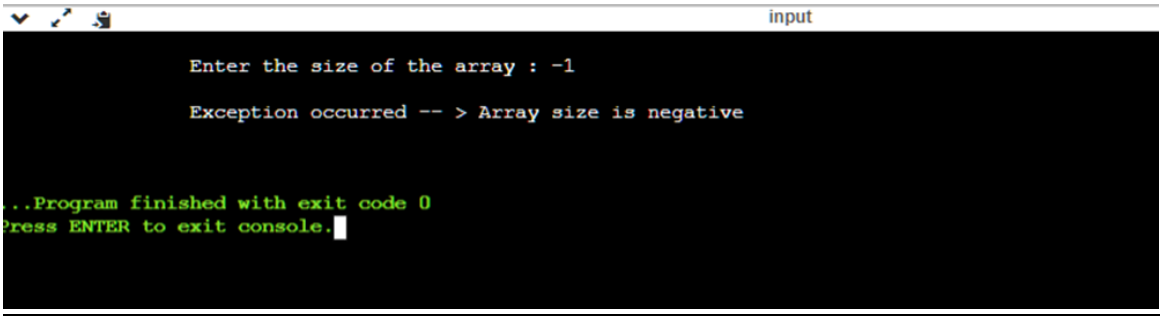
1. **समस्या विवरण:** try और catch ब्लॉक का उदाहरण देने वाला एक प्रोग्राम लिखें। इसमें चेक करें कि दिया गया एरे साइज नेगेटिव है या नहीं?

Problem Statement: Write a program for an example of try and catch block. In this check whether the given array size is negative or not?

Code

```
#include<iostream> using namespace std; class Array
{
private : int n;
int a[30]; public :
void getData()
{
cout<<"\n\t\tEnter the size of the array : "; cin>>n;
}
void getElements()
```

```
{
char ch; try
{
if(n<0)
throw ch; else
{
int i;
cout<<"\n\t\tEnter array elements : "; for(i=0;i<n;i++)
{
cin>>a[i];
}
cout<<"\n\t\tArray elements are : "; for(i=0;i<n;i++)
{
cout<<a[i]<<" ";
}
}
}
catch(char c)
{
cout<<"\n\t\tException occurred -- > Array size is negative";
}}
};
int main()
{
Array a; a.getData(); a.getElements(); cout<<"\n\n"; return 0;
}
```



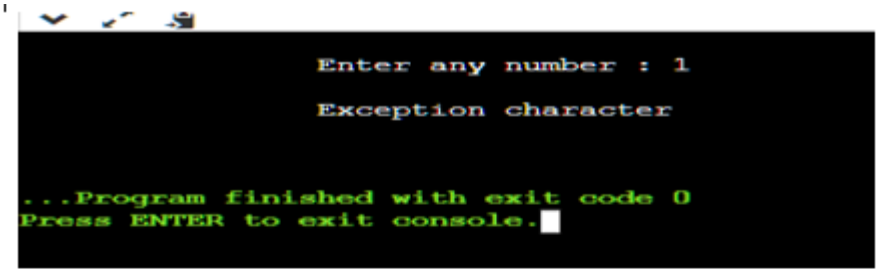
4. **समस्या विवरण:** मल्टिपल कैच स्टेटमेंट्स के उदाहरण के लिए एक प्रोग्राम लिखें।

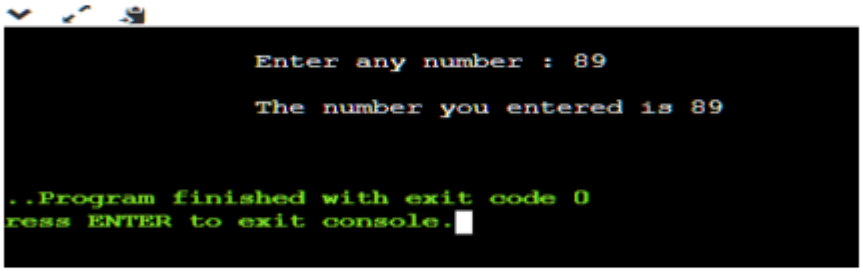
Problem Statement: Write a program for an example of multiple catch statements occurring in a program.

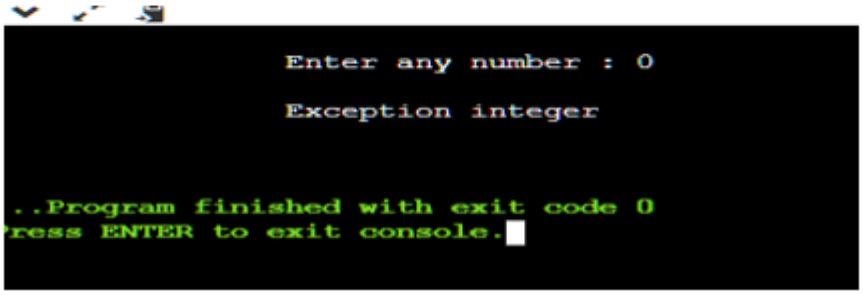
Code

```
#include<iostream> using namespace std; class Sample
{
private:
int n; public :
void getdata(); void display();
};
void Sample :: getdata()
{
cout<<"\n\t\tEnter any number : "; cin>>n;
}
void Sample :: display()
{
int a; char ch; float f; try
{
if(n==0)
throw a; else if(n==1)
throw ch;
else if(n>1 && n<10) throw f;
else
cout<<"\n\t\tThe number you entered is "<<n;
}
catch(int n)
{
cout<<"\n\t\tException integer";
}
catch(char ch)
{
cout<<"\n\t\tException character";

}
catch(float f)
{
cout<<"\n\t\tException float";
}
}
int main()
```

```
{
Sample obj; obj.getdata(); obj.display(); cout<<"\n\n"; return 0;
}
```







Lab: 13

PROLOG PROGRAMMING LANGUAGE

1. **समस्या विवरण:** फैमिली रिलेशन्स पर आधारित प्रोलॉग प्रोग्रामिंग लैंग्वेज।

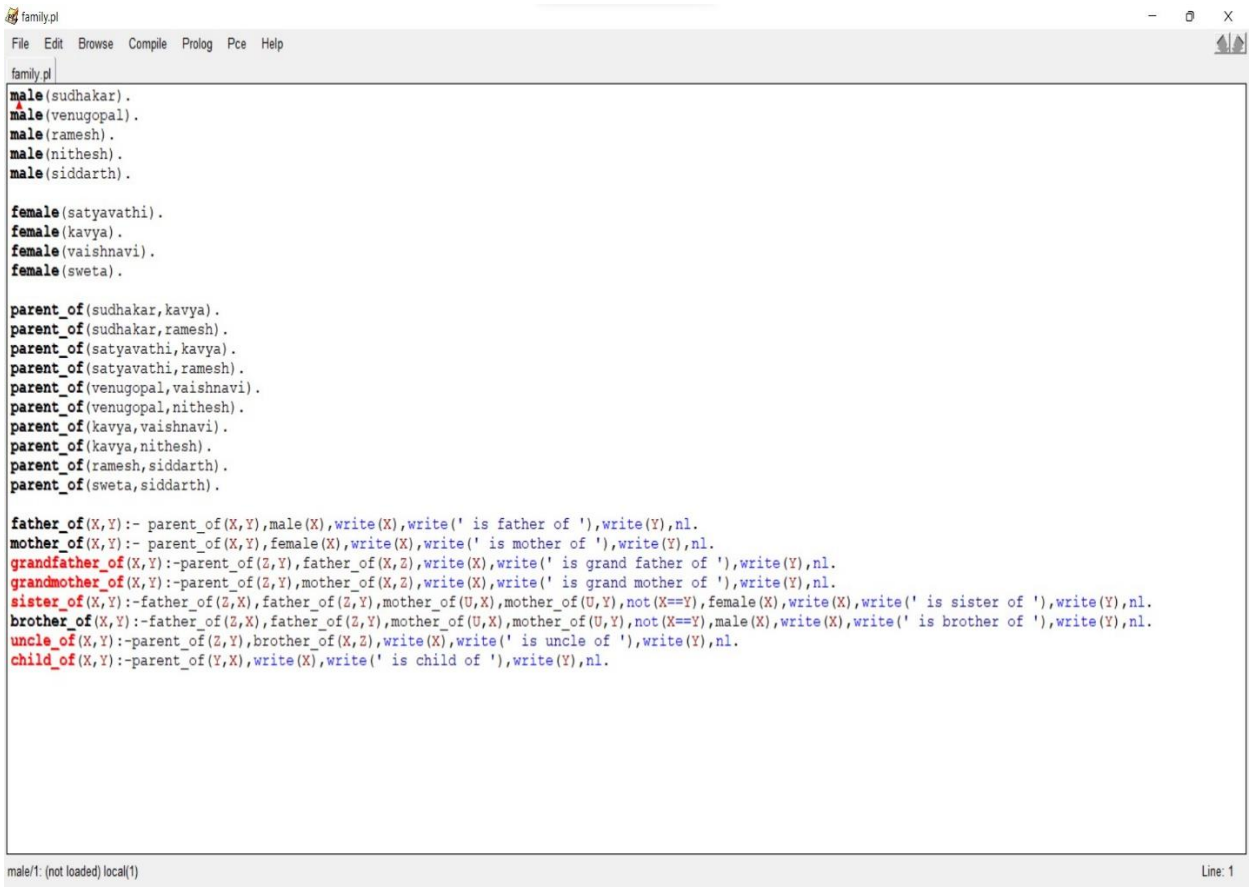
Problem Statement: Prolog programming language on family relations.

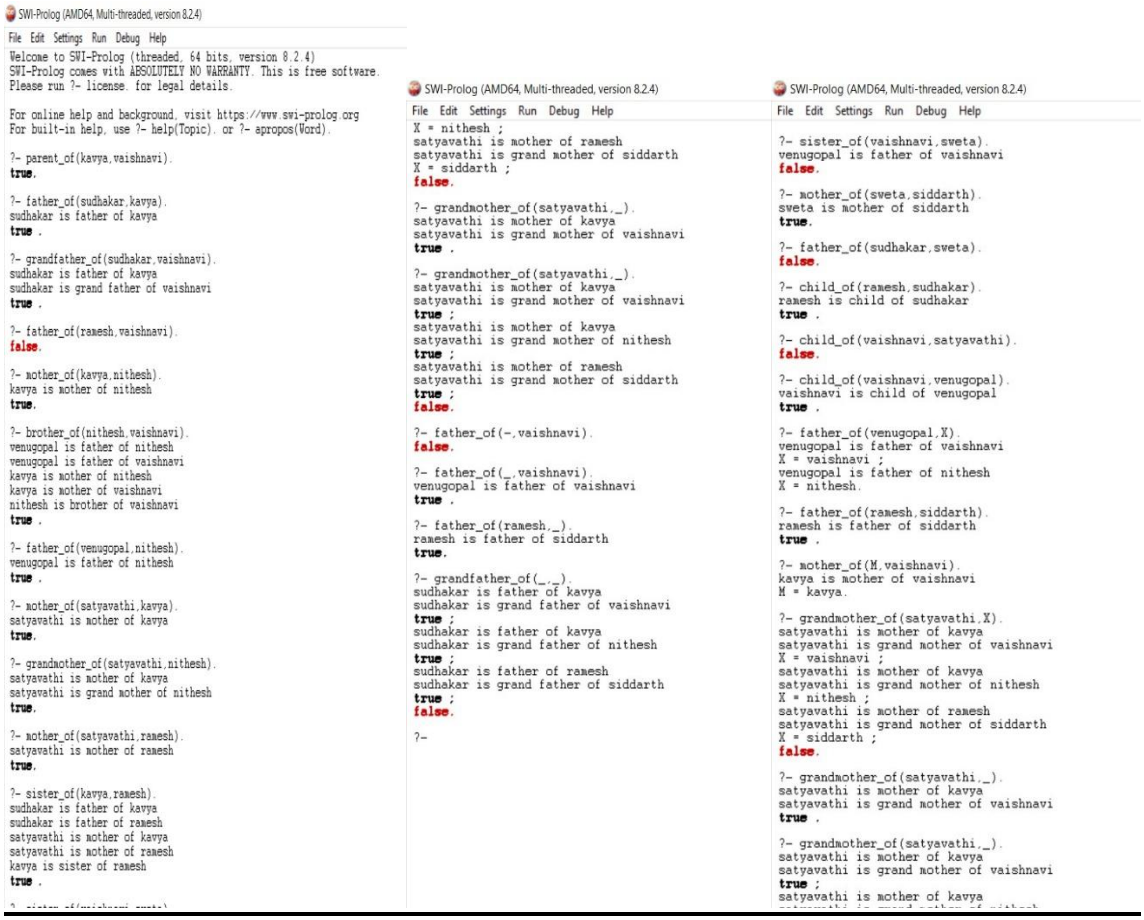
Code

```
male(sud
hakar).
male(ven
ugopal).
male(ram
esh).
male(nith
esh).
male(sidd
arth).

 female(sat
 yavathi).
 female(ka
 vya).
 female(vai
 shnavi).
 female(sw
 eta).

 parent_of(sudhakar,kavy
 a).
 parent_of(sudhakar,rame
 sh).
 parent_of(satyavathi,kav
 ya).
 parent_of(satyavathi,ram
 esh).
 parent_of(venugopal,vai
 shnavi).
 parent_of(venugopal,nit
 hesh).
 parent_of(kavya,vaishna
 vi).
 parent_of(kavya,nithesh)
 .
 parent_of(ramesh,siddart
 h).
 parent_of(sweta,siddarth
 ).

 father_of(X,Y):- parent_of(X,Y),male(X),write(X),write(' is father of
```

'),write(Y),nl. mother_of(X,Y):- parent_of(X,Y),female(X),write(X),write(' is mother of '),write(Y),nl. grandfather_of(X,Y):- parent_of(Z,Y),father_of(X,Z),write(X),write(' is grand father of '),write(Y),nl. grandmother_of(X,Y):-parent_of(Z,Y),mother_of(X,Z),write(X),write(' is grand mother of '),write(Y),nl.
sister_of(X,Y):-
father_of(Z,X),father_of(Z,Y),mother_of(U,X),mother_of(U,Y),not(X==Y),female(X),write(X),write(' is sister of '),write(Y),nl.
brother_of(X,Y):-
father_of(Z,X),father_of(Z,Y),mother_of(U,X),mother_of(U,Y),not(X==Y),male(X),write(X),write(' is brother of '),write(Y),nl.
uncle_of(X,Y):-parent_of(Z,Y),brother_of(X,Z),write(X),write(' is uncle of '),write(Y),nl.
child_of(X,Y):-parent_of(Y,X),write(X),write(' is child of '),write(Y),nl.

Screenshots :-





```
SWI-Prolog (AMD64, Multi-threaded, version 8.2.4)
File  Edit  Settings  Run  Debug  Help
Welcome to SWI-Prolog (threaded, 64 bits, version 8.2.4)
SWI-Prolog comes with ABSOLUTELY NO WARRANTY. This is free software.
Please run ?- license. for legal details.

For online help and background, visit https://www.swi-prolog.org
For built-in help, use ?- help(Topic). or ?- apropos(Word).

?- parent_of(kavya,vaishnavi).
true.

?- father_of(sudhakar,kavya).
sudhakar is father of kavya
true .

?- grandfather_of(sudhakar,vaishnavi).
sudhakar is father of kavya
sudhakar is grand father of vaishnavi
true .

?- father_of(ramesh,vaishnavi).
false.

?- mother_of(kavya,nithesh).
kavya is mother of nithesh
true.

?- brother_of(nithesh,vaishnavi).
venugopal is father of nithesh
venugopal is father of vaishnavi
kavya is mother of nithesh
kavya is mother of vaishnavi
nithesh is brother of vaishnavi
true .

?- father_of(venugopal,nithesh).
venugopal is father of nithesh
true .

?- mother_of(satyavathi,kavya).
satyavathi is mother of kavya
true.

?- grandmother_of(satyavathi,nithesh).
satyavathi is mother of kavya
satyavathi is grand mother of nithesh
true.

?- mother_of(satyavathi,ramesh).
satyavathi is mother of ramesh
true.

?- sister_of(kavya,ramesh).
sudhakar is father of kavya
sudhakar is father of ramesh
satyavathi is mother of kavya
satyavathi is mother of ramesh
kavya is sister of ramesh
true .
```

```
SWI-Prolog (AMD64, Multi-threaded, version 8.2.4)
File  Edit  Settings  Run  Debug  Help
X = nithesh ;
satyavathi is mother of ramesh
satyavathi is grand mother of siddarth
X = siddarth ;
false.

?- grandmother_of(satyavathi,_).
satyavathi is mother of kavya
satyavathi is grand mother of vaishnavi
true .

?- grandmother_of(satyavathi,_).
satyavathi is mother of kavya
satyavathi is grand mother of vaishnavi
true ;
satyavathi is mother of kavya
satyavathi is grand mother of nithesh
true ;
satyavathi is mother of ramesh
satyavathi is grand mother of siddarth
true ;
false.

?- father_of(-,vaishnavi).
false.

?- father_of(_,vaishnavi).
venugopal is father of vaishnavi
true .

?- father_of(ramesh,_).
ramesh is father of siddarth
true.

?- grandfather_of(_,_).
sudhakar is father of kavya
sudhakar is grand father of vaishnavi
true ;
sudhakar is father of kavya
sudhakar is grand father of nithesh
true ;
sudhakar is father of ramesh
sudhakar is grand father of siddarth
true ;
false.

?-
```

```
SWI-Prolog (AMD64, Multi-threaded, version 8.2.4)
File  Edit  Settings  Run  Debug  Help
?- sister_of(vaishnavi,sweta).
venugopal is father of vaishnavi
false.

?- mother_of(sweta,siddarth).
sweta is mother of siddarth
true.

?- father_of(sudhakar,sweta).
false.

?- child_of(ramesh,sudhakar).
ramesh is child of sudhakar
true .

?- child_of(vaishnavi,satyavathi).
false.

?- child_of(vaishnavi,venugopal).
vaishnavi is child of venugopal
true .

?- father_of(venugopal,X).
venugopal is father of vaishnavi
X = vaishnavi ;
venugopal is father of nithesh
X = nithesh.

?- father_of(ramesh,siddarth).
ramesh is father of siddarth
true .

?- mother_of(M,vaishnavi).
kavya is mother of vaishnavi
M = kavya.

?- grandmother_of(satyavathi,X).
satyavathi is mother of kavya
satyavathi is grand mother of vaishnavi
X = vaishnavi ;
satyavathi is mother of kavya
satyavathi is grand mother of nithesh
X = nithesh ;
satyavathi is mother of ramesh
satyavathi is grand mother of siddarth
X = siddarth ;
false.

?- grandmother_of(satyavathi,_).
satyavathi is mother of kavya
satyavathi is grand mother of vaishnavi
true .

?- grandmother_of(satyavathi,_).
satyavathi is mother of kavya
satyavathi is grand mother of vaishnavi
true ;
satyavathi is mother of kavya
```

---

2. **समस्या विवरण:** यह वेरिफाई करने के लिए एक प्रोलॉग प्रोग्रामिंग लैंग्वेज लिखें कि कोई लाइन सेगमेंट हॉरिजॉन्टल, वर्टिकल या ओब्लिक है या नहीं।

Problem Statement: Write Prolog programming language to verify whether a line segment is horizontal, vertical or oblique.

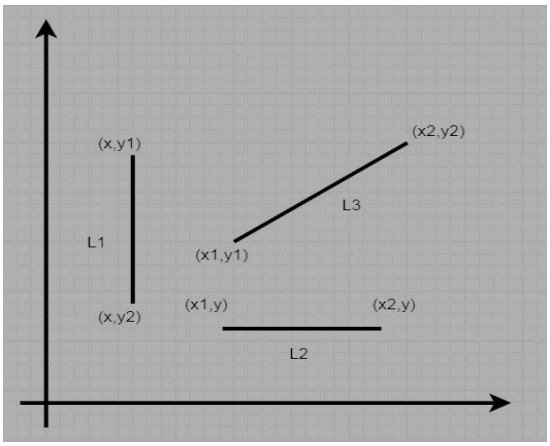
Program

```
vertical(seg(point(X,),point(X,))).
horizontal(seg(point(,Y),point(,Y))).
oblique(seg(point(X1,Y1),point(X2,Y2)))
  :-X1 \== X2,
    Y1 \== Y2.
```

Output

```
| ?- [line_seg].
```

```
compiling D:/TP Prolog/Sample_Codes/line_seg.pl for byte code...
D:/TP Prolog/Sample_Codes/line_seg.pl compiled, 6 lines read - 1276 bytes written, 26 ms
yes
| ?- vertical(seg(point(10,20), point(10,30))).
yes
| ?- vertical(seg(point(10,20), point(15,30))).
no
| ?- oblique(seg(point(10,20), point(15,30))).
yes
| ?- oblique(seg(point(10,20), point(15,20))).
no
| ?- horizontal(seg(point(10,20), point(15,20))).
yes
| ?-
```



Lab: 14

PROLOG PROGRAMMING LANGUAGE

1. **समस्या विवरण:** analyse_list/1 नाम का एक प्रोलॉग प्रेडिकेट लिखें जो एक लिस्ट को आर्ग्युमेंट के रूप में ले और स्क्रीन पर उस लिस्ट का हेड और टेल प्रिंट करे। अगर दी गई लिस्ट खाली है तो प्रेडिकेट एक मैसेज दिखाए जो इस फैक्ट को रिपोर्ट करे। अगर दिया गया आर्ग्युमेंट बिल्कुल भी लिस्ट नहीं है तो प्रेडिकेट को फेल हो जाना चाहिए।

मौलाना आज़ाद राष्ट्रीय प्रौद्योगिकी संस्थान, भोपाल – 462003
MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY BHOPAL – 462003

कंप्यूटर विज्ञान एवं अभियांत्रिकी विभाग
(Department of Computer Science and Engineering)

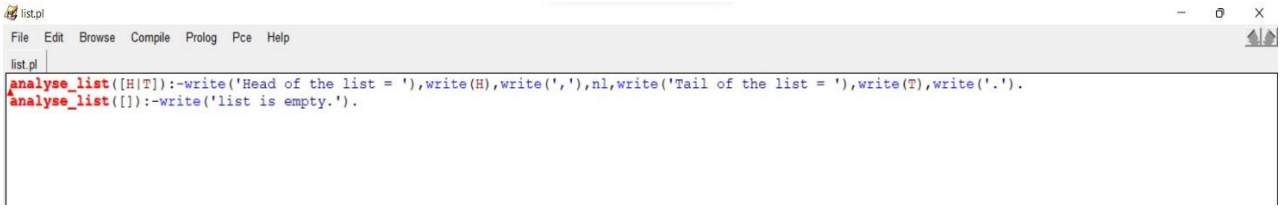
Problem Statement: Write a prolog predicate analyse_list/1 that takes a list as its argument and prints out the list's head and tail on the screen. If the given list is empty, the predicate should put out a message reporting this fact. If the argument term isn't a list at all, the predicate should just fail.

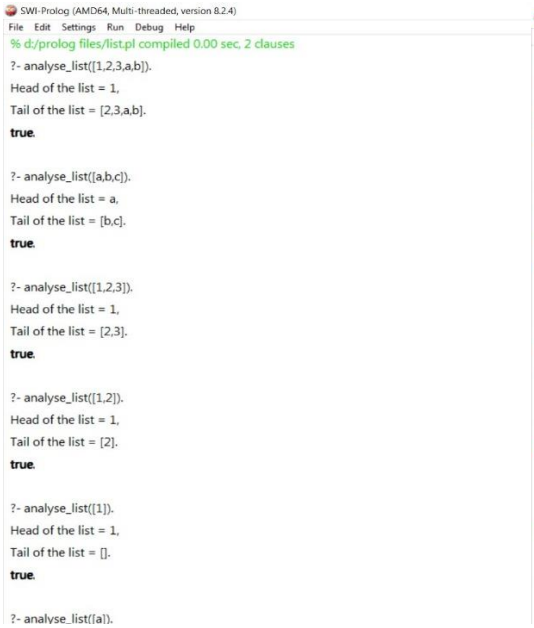
Code

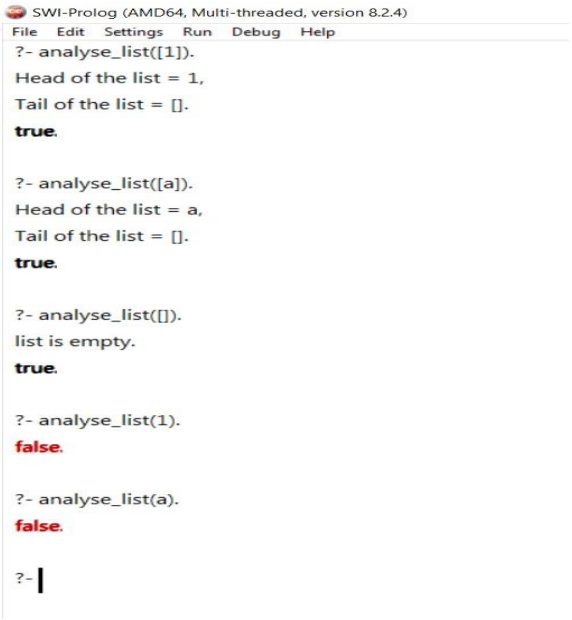
```
analyse_list([H|T]):-write('Head of the list = '),write(H),write(','),nl,write('Tail of the list = '),write(T),write('.').
analyse_list([]):-write('list is empty.').
```

QUERIES :

SCREENSHOTS :-







2. **समस्या विवरण:** किसी लिस्ट में एलिमेंट्स की संख्या और लिस्ट के एलिमेंट्स का सम ज्ञात करें।

Problem Statement: Find number of elements in a list and sum of elements of list.

Number of elements in a list :-

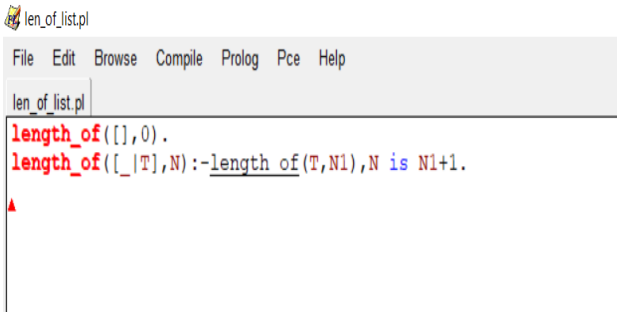
```
length_of([],0).
length_of([_|T],N):-length_of(T,N1),N is N1+1.
```

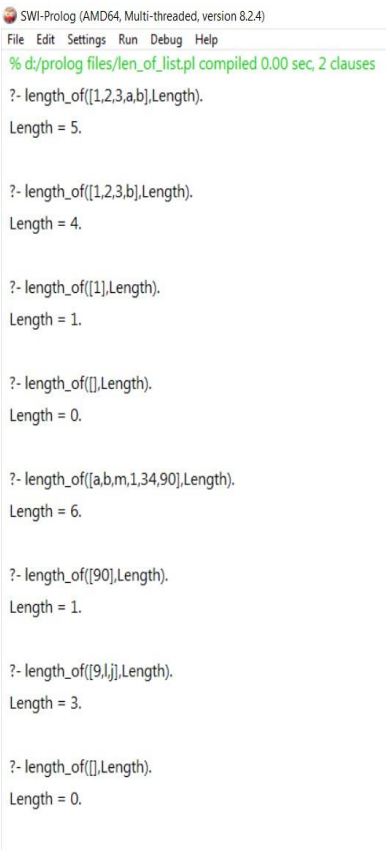
Sum of elements in a list :-

```
sumlist([],0).
sumlist([H|T],S):-sumlist(T,S1),S is S1+H.
```

QUERIES :

SCREENSHOT





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कंप्यूटर विज्ञान एवं अभियांत्रिकी विभाग
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