Internship Report

Time Stamps Problems Using C++

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Start with a basic example.

Given four variables p, q, r and s. Initialize with value 6, 9, 5 and 2. Your task is to change values accoriding to given strings as input by user and print changed values. Input string is in the format p=q , q=r and so on.

Input : “p=q” Output : 9 9 5 2

input : “s=r” Output : 6 9 5 5

Code : (Brute Force Approach)

```
#include<iostream>
using namespace std;
int main()
{
   int p = 6 , q = 9 , r = 5 , s = 2;
   char a[10];
   // take input string
   cout<<"enter a string"<<endl;
   cin>>a;
   int m;
   // use if statement for each character
   if(a[2]=='p') m = p;
   if(a[2]=='q') m = q;
   if(a[2]=='r') m = r;
   if(a[2]=='s') m = s;
   if(a[0]=='p') p = m;
   if(a[0]=='q') q = m;
   if(a[0]=='r') r = m;
   if(a[0]=='s') s = m;
   // print values.
   cout<<p<<" "<<q<<" "<<r<<" "<<s<<endl;
}
```

Optimize Approach :

Why do we need to optimize code ?

If the user has given 26 characters then you have to write 52 if conditions which is not a good approach.

- Instead of if conditions use Array data structure to store values.
- Use ASCII codes of characters to store values in an array.

Code : (Optimize Approach) **Language** : C++

```
#include<iostream>
using namespace std;
int main()
{
   int p = 6 , q = 9 , r = 5 , s = 2;
   int arr[4] = {p, q, r, s};
   char a[10];
   cout<<"enter a string"<<endl;
   cin>>a;
   arr[ a[0] - 'p' ] = arr[  a[2] - 'p' ];
   for( int i = 0; i < 4; i++ )
      cout<<arr[i]<<" ";
   return 0;
}
```

Time complexity = O(1)

Space Complexity = O(1)

Problem Statement 2 : (Adding some extra conditions in base example)

Given four variables p, q, r and s. Initialize with value 6, 9, 5 and 2. Your task is to change values accoriding to given strings as input by user and print changed values. Input string is in the format p=q , q=r, **p=3, q=5** and so on.

Input : "p=q" Output : 9 9 5 2

Input : "p=3" Output : 3 9 5 2

Constraints : Input string only contains digits **p=3** ✅, **p=10** ❌.

Code : (Optimize Approach) **Language** : C++

```
#include<iostream>
using namespace std;
int main()
{
   int p=4, q=3, r=5, s=7;
   int arr[4] = {p,q,r,s};
   while(1)
   {
      cout<<"enter a string"<<endl;
      char a[10];
      cin>>a;

      // Input is of the type p=1, q=4 ...
      if(a[2]>=48 && a[2]<=57)
      {
         arr[a[0]-'p']= a[2]-48;
       }
```

```
      // input is of the type p=q, r=s ...
       else
      {
          arr[a[0]-'p']= arr[a[2]-'p'];
       }

       //  print updated values
       for(int i=0; i<4; i++)
       {
          cout<<arr[i]<<" ";
        }
       cout<<endl;

    }
return 0;

}
```

Time complexity = O(1)

Space Complexity = O(1)

Problem Statement 3 : (Adding Time intervals)

Given four variables p, q, r and s. Initialize with value 6, 9, 5 and 2 at **Time 0**. Your task is to change values accoriding to given strings as input by user and print changed values. Input string is in the format "p**2**=q**4**" , "q**2**=r**7**" , "p**5**=4" and so on.

"q**2**=r**7**" means after 2 minitues value of q changes to value of r after 7 minutes.

"p**5**=**4**" means after 5 minitues value of p changes to 4.

Constraints : Input string only contains digits **"p2=q"** ✅, **"p10=q"** ❌, **"p5=11"** ❌.

Approach :

Use **Array** data data structure to store time 0 th index of array use as initial time 0 minitues, similarly for 1, 2,...,9.

Initialize p[0] = 6 it is given value.

p array

6	0	0	0	0	0	0	0	0	0
0	1	2	3	4	5	6	7	8	9

If you require p[7] value and it is zero, move backward until you will get a non zero value.

In the given example p[7] takes value 8.

p array

6	0	0	0	8	0	0	0	0	0
0	1	2	3	4	5	6	7	8	9

Code : (Optimize Approach) **Language** : C++

```
#include <iostream>
        using namespace std;
        int main()
        {
           int zw[4][20] = {0};
           zw[0][0]=1;
           zw[1][0]=2;
           zw[2][0]=3;
           zw[3][0]=4;
           while(1)
           {
              cout<<"enter a string"<<endl;
              char ch[20];
              cin>>ch;
              int t = ch[1]-48, dist = ch[4]-48, x=ch[3]-'p', u;
              if(ch[3]-48 < 64 )
                 u=ch[3]-48;
              else
              {
                 while(zw[x][dist]==0)
                 {
                        dist--;
                 }
                 u=zw[x][dist];
              }
              zw[ch[0]-'p'][t] = u;
```

```
// print values
for(int i=0;i<4;i++)
      {
                  for(int j=0;j<20;j++)
                   cout<<zw[i][j]<<" ";
            cout<<endl;
       }
  }
   return 0;
}
```

Time complexity = O(1)

Space Complexity = O(1)

Problem Statement 4 : (Identify error when values changes with time)

In **problem statement 3** , the user gives input in the following way.

“p4=8”

“p9=3”

“q2=p7”

“P6=4”

For the last input **“P6=4”** gives an error , why ?

Take the first input **“p4=8”** changes in p and q arrays are.

p array

6	0	0	0	**8**	0	0	0	0	0
0	1	2	3	4	5	6	7	8	9

q array

9	0	0	0	0	0	0	0	0	0
0	1	2	3	4	5	6	7	8	9

Take the second input **“p9=3”** changes in p and q arrays are.

p array

6	0	0	0	8	0	0	0	0	0
0	1	2	3	4	5	6	7	8	9

q array

9	0	0	0	0	0	0	0	0	**3**
0	1	2	3	4	5	6	7	8	9

Take the third input **“q2=p7”** changes in p and q arrays are.

p array

6	0	0	0	8	0	0	0	0	0
0	1	2	3	4	5	6	7	8	9

q array

9	0	8	0	0	0	0	0	0	3
0	1	2	3	4	5	6	7	8	9

Note : as p[7]=0 , it moves backward until it gets a non zero value, q[2] takes value from p[4] which is 8 **as the value of p[7]**. So it acts like **p[4], p[5], p[6], p[7] have a save value 8.**

Take the fourth input **“p6=4”** changes in p and q arrays are.

p array

6	0	0	0	8	0	0	0	0	0
0	1	2	3	4	5	6	7	8	9

q array

9	0	8	0	0	0	0	0	0	3
0	1	2	3	4	5	6	7	8	9

If you change the value of **p[6] as 4**, then you have to change the value of **q[2]** . Because from the third input **q[2] is dependent on p[7]** , **p[7] depends on p[6], p[5], p[4]**. So write a program in a way that for **“p6=4”** input users get errors.

Code : (Optimize Approach) **Language** : C++

```
#include <iostream>
        using namespace std;
        int main()
        {
           int zw[4][20] = {0}, zr[4][20] = {0};
           zw[0][0]=1;
           zw[1][0]=2;
           zw[2][0]=3;
           zw[3][0]=4;
           while(1)
           {
              cout<<"enter a string"<<endl;
              char ch[20];
              cin>>ch;
              int t = ch[1]-48, dist = ch[4]-48, x=ch[3]-'p', u;
              if(zr[ch[0]-'p'][t]==1)
              {
                 cout<<"error"<<endl;
                 break;
              }
              if(ch[3]-48 < 64 )
              {
                 u=ch[3]-48;
              }
              else
              {
                 while(zw[x][dist]==0)
                 {
```

```
                zr[x][dist]=1;
                dist--;
              }
              u=zw[x][dist];
            }
            zw[ch[0]-'p'][t] = u;


            for(int i=0;i<4;i++)
           {
            for(int j=0;j<20;j++)
            {
               cout<<zw[i][j]<<" ";
            }
             cout<<endl;
            }
        }
        return 0;
    }
```

Time complexity = O(1)

Space Complexity = O(1)