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DS Assignment - 02

B.Tech. CSE

CSE Section -2

1) Time Complexity Analysis :

```cpp
#include<bits/stdc++.h>
using namespace std;
typedef long long ll;

void timeAnalysis(int a[],int n){
    srand(0);
    int k = rand()%n ;
    clock_t s_time , e_time ;
            //start    end
    //O(1) Constant Time Complexity :: Accessing and increasing element by 1
    // cout<<a[k]<<endl;

    s_time = clock(); //Noting starting time
    a[k]=a[k]+1;
    e_time = clock(); //Noting end time
    double total_time = e_time - s_time; //Difference
    cout<<(double)total_time/(double)CLOCKS_PER_SEC<<"  ";

    //O(n) :: Increasing element by one
    s_time = clock();
    for (int i = 0; i < n; i++)
    {
        a[i]=a[i]+1;
    }
    e_time =clock();
    total_time = e_time - s_time; //Difference
    cout<<(double)total_time/(double)CLOCKS_PER_SEC<<"  ";


    //O(n^2) :: Sorting Array
    s_time = clock();
    for(int i=0;i<n-1;i++){
        for(int j=i+1;j<n;j++)
            if(a[i]>a[j+1]){
                swap(a[i],a[j]);
            }
            else
            continue;
```

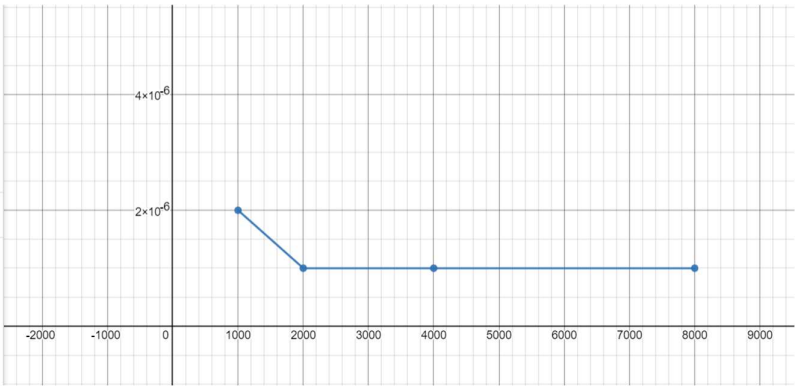
```
    }
    e_time =clock();
    total_time = e_time - s_time; //Difference
    cout<<(double)total_time/(double)CLOCKS_PER_SEC<<"  ";

}
int main(){
ios_base::sync_with_stdio(false);
cin.tie(NULL);
cout<<"O(1)  O(n)  O(n^2)\n";
int t=4;
    int n=1000;
    while(t--){
    n=n*2;
    int a[n];
    srand(time(0));
    for(int i=0;i<n;i++) a[i]=rand()%n+1;

    timeAnalysis(a,n);
    cout<<"\n";
    }
return 0;
}
```

Output

```
O(1)     O(n)  O(n^2)
2e-06   6e-06   0.017185
1e-06   1.1e-05 0.065996
1e-06   1.9e-05 0.255068
1e-06   3.6e-05 1.09756
```

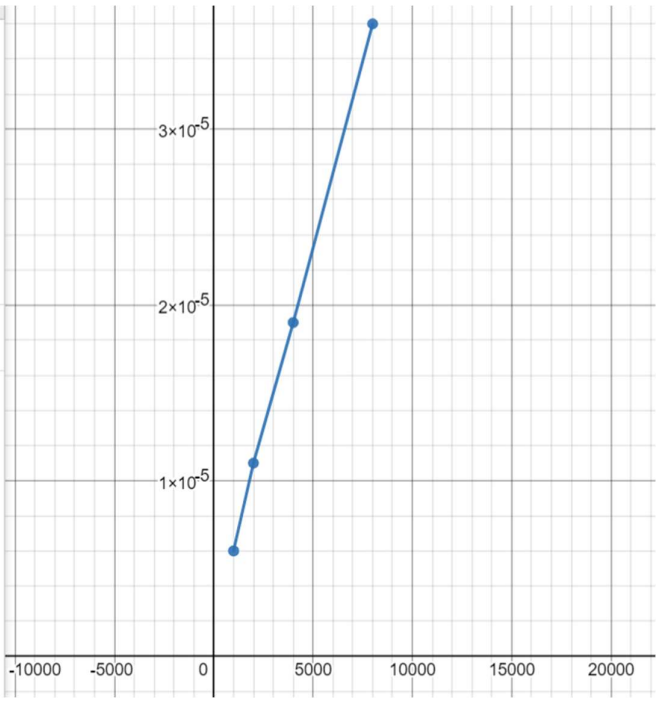
O(1) :Constant Value Function

x	y
1000	0.000002
2000	0.000001
4000	0.000001
8000	0.000001



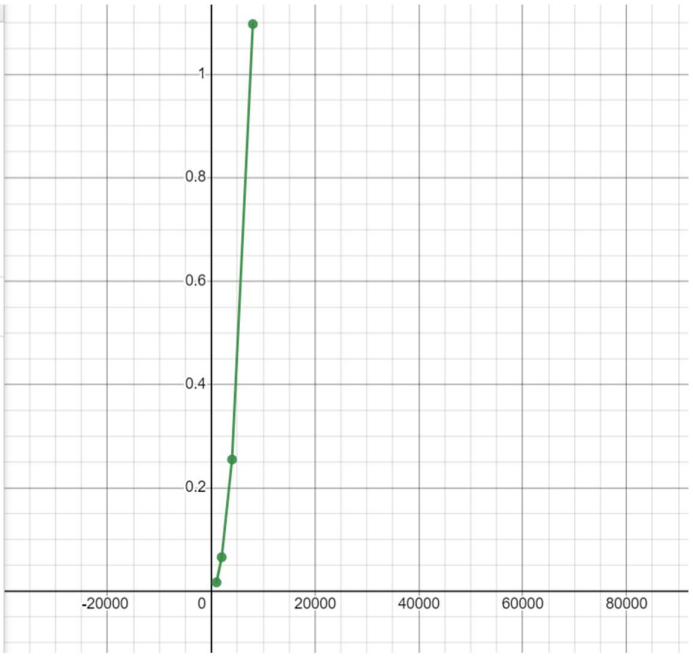
O(n) : Linear Curve

x	y
1000	0.000006
2000	0.000011
4000	0.000019
8000	0.000036



O(n^2) : Parabolic Curve

x_1	y_1
1000	0.017185
2000	0.065996
4000	0.255068
8000	1.09756



2) Program to find number of days between 2 given dates .

```
from datetime import date
```

```python
# Function to find number of days
def numOfDays(date1, date2):
    return (date2-date1).days

d,m,y= input("Enter date-1 : ").split()
date1 = date( int(y), int(m), int(d))

d,m,y= input("Enter date-2 : ").split()
date2= date( int(y), int(m), int(d))

ans = numOfDays(date1,date2)
if ans>0:
    print(ans, "days");
else:
    print(-ans, "days")
```

```
PS D:\MANIT_3rd_Sem\Data_Structures\Assignment-02> python .\2.py
Enter date-1 : 12 4 2019
Enter date-2 : 16 1 2022
1010 days
```

3) Find day of the week for the given date .

```cpp
// C++ program to Find the Day
#include <bits/stdc++.h>
using namespace std;

int Zellercongruence(int day, int month, int year)
{
    if (month == 1) {
        month = 13;
        year--;
    }
    if (month == 2) {
        month = 14;
        year--;
    }
    int q = day;
    int m = month;
    int k = year % 100;
    int j = year / 100;
    //Zeller's Formula :
    int h = q + 13 * (m + 1) / 5 + k + k / 4 + j / 4 + 5 * j;
    h = h % 7;
    switch (h) {
```

```
    case 0:
        cout << "Saturday \n";
        break;
    case 1:
        cout << "Sunday \n";
        break;
    case 2:
        cout << "Monday \n";
        break;
    case 3:
        cout << "Tuesday \n";
        break;
    case 4:
        cout << "Wednesday \n";
        break;
    case 5:
        cout << "Thursday \n";
        break;
    case 6:
        cout << "Friday \n";
        break;
    }
    return 0;
}

int main()
{
    int d,m,y;
    cin>>d>>m>>y;

    Zellercongruence(27,02,2023); // date (dd/mm/yyyy)
    return 0;
}
```

```
PS D:\MANIT_3rd_Sem\Data_Structures\Assignment-02> .\a.exe
23 6 2002
Sunday
```

4) Convert integer ‘n seconds’ into days , hours , minutes , seconds .

```
#include<bits/stdc++.h>
using namespace std;
typedef long long ll;
int main(){
ios_base::sync_with_stdio(false);
cin.tie(NULL);
    int n; cin>>n;
```

```
    // 1h = 60*60 s
    // 24h = 3600*24
    int temp = n;
    int d = n/(24*3600);
    int h = (n%(24*3600))/(24*60);
    int m = ((n%(24*3600))%(24*60)/60);
    int s = ((n%(24*3600))%(24*60)%60);
    cout<<temp<<" Seconds = "<<d<<" Days "<<h<<" hours "<<m<<" minutes "<<s<<"
seconds ";
return 0;
}
```

```
PS D:\MANIT_3rd_Sem\Data_Structures\Assignment-02> .\a.exe
1200
1200 Seconds = 0 Days 0 hours 20 minutes 0 seconds
PS D:\MANIT_3rd_Sem\Data_Structures\Assignment-02> .\a.exe
356000
356000 Seconds = 4 Days 7 hours 5 minutes 20 seconds
```

5) Convert number of days ‘n’ into years , weeks and days .

```
#include<bits/stdc++.h>
using namespace std;
typedef long long ll;
int main(){
ios_base::sync_with_stdio(false);
cin.tie(NULL);
    int n;
    cin>>n;

    int y = n/365;
    int w = (n%365)/7;
    int d = (n%365)%7;

    cout<<y<<" Years "<<w<<" Weeks "<<d<<" Days \n";
return 0;
}
```

```
PS D:\MANIT_3rd_Sem\Data_Structures\Assignment-02> .\a.exe
453
1 Years 12 Weeks 4 Days
```

6) Calculate age .

```
from datetime import date

def age(birthdate):
    today = date.today()
```

```
    age = today.year - birthdate.year - ((today.month, today.day) <
(birthdate.month, birthdate.day))
    return age

birthdate = date(2002,2,1)

print(age(birthdate))
```

```
PS D:\MANIT_3rd_Sem\Data_Structures\Assignment-02> python .\7.py
20
```

7) Leap Year or not ?

```
//Leap Year
#include <iostream>
using namespace std;

int main() {
    int year;
    cin>>year;

    if(((year % 4 == 0) && (year % 100 != 0)) ||(year % 400 == 0)){
        cout<<"Leap Year\n";
    }
    return 0;
}
```

```
PS D:\MANIT_3rd_Sem\Data_Structures\Assignment-02> .\a.exe
2000
Leap Year
PS D:\MANIT_3rd_Sem\Data_Structures\Assignment-02> .\a.exe
2005
```